WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3	**Run 2b DAQ and Trigger Project**	**$3,315,867**	**$2,766,277**	**$549,590**	**0**	**0**	**0**

Notes

WBS Description:

Project includes TDC upgrade, XFT upgrade, L2 upgrade, SVT upgrade, EVB upgrade and L3 PC replacements.

1.3.1	**Run 2b TDC Project**	**$583,222**	**$497,744**	**$85,478**	**0**	**0**	**0**

Notes

WBS Description:

This summary element covers the development and construction of new time to digital converters (TDC) used in the readout of the CDF central outer tracker (COT).

1.3.1.1	L3 Start Run 2b TDC Subproject	$0	$0	$0	0	0	3

Notes

WBS Description:

Milestone - denoting the start of the Run 2b TDC level 3 subproject

1.3.1.2	**Specification & Development**	**$50,840**	**$44,240**	**$6,600**	**0**	**0**	**0**

Notes

WBS Description:

This summary task covers the new TDC's specification and development on hit time digitization, buffer management, front-end ASDQ and trigger interfaces and data compression

1.3.1.2.1	**Formal Specification**	**$1,120**	**$1,120**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

This task covers cost of TDC functionality specifications and their physics justification

1.3.1.2.1.1	Block Diagram (Chicago)	$560	$560	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
11	*INKIND*	*560*	*560*	*0 days*	*6/24/02*	*6/25/02*	*$560*	*$560*	*$560*	*$0*

Notes

WBS Description:

This item covers the TDC functional block diagram design

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Block Diagram (Chicago)" continued

Notes

M&S BOE: N/A

Labor BOE:

100% - Chicago Electrical Eng. - 2d (16 hrs)@$70/hr = $1120

1.3.1.2.1.2	Physics Justification	$0	$0	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
14	*PostDoc*	*100%*	*160 hrs*	*0 days*	*7/11/02*	*8/7/02*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

This item covers physics justification for the design from Run IIa experience and Run IIb luminosity conditions

M&S BOE: N/A

Labor BOE:

This is the time spent on the task

1.3.1.2.1.3	Block Diagram (FNAL)	$560	$560	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*560*	*560*	*0 days*	*6/24/02*	*6/25/02*	*$560*	*$560*	*$560*	*$0*

1.3.1.2.2	**Interface Specification**	**$17,800**	**$11,200**	**$6,600**	**0**	**0**	**0**

Notes

WBS Description:

This summary task covers cost of the specification for the interfaces to COT ASDQ, XFT and other DAQ components

1.3.1.2.2.1	Trigger	$6,600	$0	$6,600	0	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
4	*ElecEngF*	*50%*	*120 hrs*	*0 days*	*9/30/02*	*11/8/02*	*$6,600*	*$6,600*	*$6,600*	*$0*
13	*Physicist*	*100%*	*240 hrs*	*0 days*	*9/30/02*	*11/8/02*	*$0*	*$0*	*$0*	*$0*

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Trigger" continued

Notes

WBS Description:

This item covers inferace specification to Level 1 XFT

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including CDF Run 2a TDC, trigger and calorimeter systems

1.3.1.2.2.2	ASDQ	$0	$0	$0	0	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
13	*Physicist*	*100%*	*120 hrs*	*0 days*	*9/30/02*	*10/18/02*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

This item covers interface specification to the COT front-end ASDQ

M&S BOE: N/A

Labor BOE:

Labor estimated base upon recent experience with systesm of similar scope, including CDF Run 2a TDC, trigger and calorimeter systems

1.3.1.2.2.3	Crate - Hardware	$0	$0	$0	0	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
13	*Physicist*	*100%*	*120 hrs*	*0 days*	*10/21/02*	*11/8/02*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

This item covers interface specification to VME crate

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope including CDF Run 2a TDC, trigger and calorimeter systems

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.2.4	Data Transmission (FNAL)	$5,600	$5,600	$0	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	5,600	5,600	0 days	9/30/02	11/26/02	$5,600	$5,600	$5,600	$0

Notes

WBS Description:

This item covers the interface specification for the TDC to VME data transmission
The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% - Chicago Electrical Eng. - 8wks (160 hrs)@$70/hr = $11200

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.2.5	Data Transmission (Chicago)	$5,600	$5,600	$0	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	5,600	5,600	13.5 days	10/17/02	11/26/02	$5,600	$5,600	$5,600	$0

Notes

WBS Description:

This item covers the interface specification for the TDC to VME data transmission. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% - Chicago Electrical Eng. - 8w (160 hrs)@$70/hr = $11200

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.3	**Front End Timing (FNAL)**	**$8,960**	**$8,960**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

This summary task covers the hit time window digitization and programmability

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.3.1	Simulation	$3,360	$3,360	$0	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	3,360	3,360	0 days	8/8/02	10/31/02	$3,360	$3,360	$3,360	$0

Notes

WBS Description:

This item covers the FPGA and board level simulation, as well as the timing interfaces to the COT front end and the CDF trigger and data acquistion system. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

20% - Chicago Electrical Eng. - 12w (96 hrs)@$70/hr = $6720

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.3.2	Test Board	$5,600	$5,600	$0	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	5,600	5,600	0 days	11/1/02	1/3/03	$5,600	$5,600	$5,600	$0
13	Physicist	50%	120 hrs	0 days	11/1/02	12/16/02	$0	$0	$0	$0

Notes

WBS Description:

This item covers the cost of building a test board. This is a small board containing an FPGA and some I/O components to test and evaluate the charateristics of the Altera Stratix FPGA. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Altera chip quotation at $1035 from Arrow Electronics. Remaining aspects of board are physicist's estimate.

Labor BOE:

Labor estimated based upon recent experience with test boards of similar scope developed for the Run 2a trigger system.

50% - Chicago Electrical Eng. - 8w (160 hrs)@$70/hr = $11200

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.4	**Front End Timing (Chicago)**	**$8,960**	**$8,960**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

This summary task covers the hit time window digitization and programmability

1.3.1.2.4.1	Simulation	$3,360	$3,360	$0	1	1	0			

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
11	*INKIND*	*3,360*	*3,360*	*0 days*	*8/8/02*	*10/31/02*	*$3,360*	*$3,360*	*$3,360*	*$0*

Notes

WBS Description:

This item covers the FPGA and board level simulation, as well as the timing interfaces to the COT front end and the CDF trigger and data acquistion system. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

20% - Chicago Electrical Eng. - 12w (96 hrs)@$70/hr = $6720

1.3.1.2.4.2	Test Board	$5,600	$5,600	$0	1	1	0			

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
11	*INKIND*	*5,600*	*5,600*	*20 days*	*12/3/02*	*1/3/03*	*$5,600*	*$5,600*	*$5,600*	*$0*

Notes

WBS Description:

This item covers the cost of building a test board. This is a small board containing an FPGA and some I/O components to test and evaluate the charateristics of the Altera Stratix FPGA. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Altera chip quotation at $1035 from Arrow Electronics. Remaining aspects of board
are physicist's estimate.

Labor BOE:

Labor estimated based upon recent experience with test boards of similar scope developed for the Run 2a trigger system.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Test Board" continued

Notes

50% - Chicago Electrical Eng. - 8w (160 hrs)@$70/hr = $11200

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.5	**Buffer Management (FNAL)**	**$3,220**	**$3,220**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

This summary task covers the design of TDC buffer management to meet the CDF DAQ protocol

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.5.1	Simulation	$1,120	$1,120	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*1,120*	*1,120*	*0 days*	*8/8/02*	*9/5/02*	*$1,120*	*$1,120*	*$1,120*	*$0*

Notes

WBS Description:

This item covers the cost of simulation for buffer management. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

20% - Chicago Electrical Eng. - 4w (32 hrs)@$70/hr = $2240

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.5.2	Trial Implementation	$2,100	$2,100	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*2,100*	*2,100*	*11.25 days*	*9/23/02*	*9/26/02*	*$2,100*	*$2,100*	*$2,100*	*$0*
14	*PostDoc*	*150%*	*45 hrs*	*11.25 days*	*9/23/02*	*9/26/02*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

This item covers the cost of a trial implementation of the buffer management design. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Trial Implementation" continued

Notes

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% - Chicago Electrical Eng. - 3w (60 hrs)@$70/hr = $4200

1.3.1.2.6	**Buffer Management (Chicago)**	**$3,220**	**$3,220**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

This summary task covers the design of TDC buffer management to meet the CDF DAQ protocol

1.3.1.2.6.1	Simulation	$1,120	$1,120	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
11	*INKIND*	*1,120*	*1,120*	*0 days*	*8/8/02*	*9/5/02*	*$1,120*	*$1,120*	*$1,120*	*$0*

Notes

WBS Description:

This item covers the cost of simulation for buffer management. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

20% - Chicago Electrical Eng. - 4w (32 hrs)@$70/hr = $2240

1.3.1.2.6.2	Trial Implementation	$2,100	$2,100	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
11	*INKIND*	*2,100*	*2,100*	*7.5 days*	*9/17/02*	*9/26/02*	*$2,100*	*$2,100*	*$2,100*	*$0*

Notes

WBS Description:

This item covers the cost of a trial implementation of the buffer management design. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Trial Implementation" continued

Notes

resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% - Chicago Electrical Eng. - 3w (60 hrs)@$70/hr = $4200

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.7	**VME Interface (FNAL)**	**$2,940**	**$2,940**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

This summary task covers the design of the TDC chip to VME interface and other related issues

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.7.1	Trial Implementation	$2,100	$2,100	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*2,100*	*2,100*	*0 days*	*11/27/02*	*12/17/02*	*$2,100*	*$2,100*	*$2,100*	*$0*
14	*PostDoc*	*50%*	*60 hrs*	*0 days*	*11/27/02*	*12/17/02*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

This item covers the cost of the trial implementation of the TDC to VME interface. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% - Chicago Electrical Eng. - 3w (60 hrs)@$70/hr = $4200

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.7.2	Simulation	$840	$840	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
11	*INKIND*	*840*	*840*	*0 days*	*9/6/02*	*9/26/02*	*$840*	*$840*	*$840*	*$0*

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Simulation" continued

Notes

WBS Description:

This item covers the cost of the simulation for the TDC chip to VME interface. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

20% - Chicago Electrical Eng. - 3w (24 hrs)@$70/hr = $1680

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.8	**VME Interface (Chicago)**	**$2,940**	**$2,940**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

This summary task covers the design of the TDC chip to VME interface and other related issues

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.8.1	Simulation	$840	$840	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
11	*INKIND*	*840*	*840*	*0 days*	*9/6/02*	*9/26/02*	*$840*	*$840*	*$840*	*$0*

Notes

WBS Description:

This item covers the cost of the simulation for the TDC chip to VME interface. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

20% - Chicago Electrical Eng. - 3w (24 hrs)@$70/hr = $1680

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.8.2	Trial Implementation	$2,100	$2,100	$0	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	2,100	2,100	0 days	11/27/02	12/17/02	$2,100	$2,100	$2,100	$0

Notes

WBS Description:

This item covers the cost of the trial implementation of the TDC to VME interface. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% - Chicago Electrical Eng. - 3w (60 hrs)@$70/hr = $4200

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.9	Design Review (FNAL)	$840	$840	$0	0	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	840	840	0 days	7/14/03	7/16/03	$840	$840	$840	$0

Notes

WBS Description:

The TDC design review task is a milesone.

Note: A successful review on the "Specification & Development" means we are ready to proceed to the "Detailed Design" stage.

M&S BOE: N/A

Labor BOE :

Cost of an engineer attending the review

100% Chicago Electrical Eng. - 3 days (24 hrs) @$70/hr = $1680

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.2.10	Design Review (Chicago)	$840	$840	$0	0	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	840	840	0 days	7/14/03	7/16/03	$840	$840	$840	$0

Notes

WBS Description:

The TDC design review task is a milesone.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Design Review (Chicago)" continued

Notes

Note: A successful review on the "Specification & Development" means we are ready to proceed to the "Detailed Design" stage.

M&S BOE: N/A

Labor BOE :

Cost of an engineer attending the review

100% Chicago Electrical Eng. - 3 days (24 hrs) @$70/hr = $1680

1.3.1.3	Detailed Design (FNAL)	$83,817	$36,684	$47,133	0	0	0

Notes

WBS Description:

This summary tasks covers the detailed design for the specifications developed previously.

1.3.1.3.1	Front End	$5,600	$5,600	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*5,600*	*5,600*	*0 days*	*1/9/03*	*7/22/03*	*$5,600*	*$5,600*	*$5,600*	*$0*

Notes

WBS Description:

This task covers the cost of the detailed desgin fo the time widow dgitization. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 4 wks (160 hrs) @$70/hr = $11200

1.3.1.3.2	Trigger Interface	$5,600	$5,600	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*5,600*	*5,600*	*0 days*	*2/7/03*	*7/28/03*	*$5,600*	*$5,600*	*$5,600*	*$0*

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Trigger Interface" continued

Notes

WBS Description:

Detailed design of the interface to the XFT Trigger. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 4 wks (160 hrs) @$70/hr = $11200

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.3.3	Compression	$4,200	$4,200	$0	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	4,200	4,200	0 days	3/7/03	7/31/03	$4,200	$4,200	$4,200	$0

Notes

WBS Description:

Detailed Design of the on board data format compression design. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 3 wks (120 hrs) @$70/hr = $8400

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.3.4	Buffers	$4,200	$4,200	$0	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	4,200	4,200	0 days	3/28/03	4/17/03	$4,200	$4,200	$4,200	$0

Notes

WBS Description:

Detailed design of the L1 and L2 buffers on the TDC boards. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Buffers" continued

Notes

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 3 wks (120 hrs) @$70/hr = $8400

1.3.1.3.5	VME	$2,800	$2,800	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*2,800*	*2,800*	*0 days*	*4/18/03*	*1/9/04*	*$2,800*	*$2,800*	*$2,800*	*$0*

Notes

WBS Description:

Detailed design for the TDC-VME interfaces. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 2 wks (80 hrs) @$70/hr = $5600

1.3.1.3.6	Test Paths	$1	$1	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*1*	*1*	*0 days*	*5/2/03*	*6/20/03*	*$1*	*$2,800*	*$1*	*$0*

Notes

WBS Description:

This task covers the cost of the board testing paths. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Test Paths" continued

Notes

100% Chicago Electrical Eng. - 2 wks (80 hrs) @$70/hr = $5600

1.3.1.3.7	Board Layout	$5,460	$5,460	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*5,460*	*5,460*	*0 days*	*5/23/03*	*6/20/03*	*$5,460*	*$8,400*	*$5,460*	*$0*

Notes

WBS Description:

This task describes the TDC board layout design. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 6 wks (240 hrs) @$70/hr = $16800

1.3.1.3.8	Board Simulation	$1,543	$1,543	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*1,543.26*	*1,543.26*	*0 days*	*7/7/03*	*8/29/03*	*$1,543*	*$8,400*	*$1,543*	*$0*

Notes

WBS Description:

This task covers the simuation tests of the board layout and functions. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 6 wks (240 hrs) @$70/hr = $16800

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.3.9	Documentation	$7,000	$7,000	$0	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	7,000	7,000	0 days	8/18/03	9/23/03	$7,000	$7,000	$7,000	$0

Notes

WBS Description:

This task covers the cost for the documentation of the detailed design. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 5 wks (200 hrs) @$70/hr = $14000

1.3.1.3.10	Firmware development	$47,133	$0	$47,133	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	52%	856.97 hrs	0 days	7/28/03	5/20/04	$47,133	$27,500	$47,133	$0

Notes

WBS Description:

This task covers the cost for firmware development for FPGA functions

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.3.11	Design Review	$280	$280	$0	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	280	280	0 days	7/16/03	7/16/03	$280	$280	$280	$0

Notes

WBS Description:

This milestone is a design review is for the detailed design of the TDC boards. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

Note: A successful review on the "Detailed Design" means that we are ready to proceed to the prototyping phase.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Design Review" continued

Notes

M&S BOE: N/A

Labor BOE:

One day of engineer labor cost for the review meeting

100% Chicago Electrical Eng. - 1 day (8 hrs) @$70/hr = $560

1.3.1.4	**Detailed Design (Chicago)**	**$43,551**	**$43,551**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

This summary tasks covers the detailed design for the specifications developed previously.

1.3.1.4.1	Front End	$5,600	$5,600	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
11	*INKIND*	*5,600*	*5,600*	*3 days*	*1/14/03*	*2/6/03*	*$5,600*	*$5,600*	*$5,600*	*$0*

Notes

WBS Description:

This task covers the cost of the detailed desgin fo the time widow dgitization. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 4 wks (160 hrs) @$70/hr = $11200

1.3.1.4.2	Trigger Interface	$5,600	$5,600	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
11	*INKIND*	*5,600*	*5,600*	*2.66 days*	*2/11/03*	*2/12/03*	*$5,600*	*$5,600*	*$5,600*	*$0*

Notes

WBS Description:

Detailed design of the interface to the XFT Trigger. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Trigger Interface" continued

Notes

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 4 wks (160 hrs) @$70/hr = $11200

1.3.1.4.3	Compression	$4,200	$4,200	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
11	*INKIND*	*4,200*	*4,200*	*0 days*	*3/7/03*	*3/18/03*	*$4,200*	*$4,200*	*$4,200*	*$0*

Notes

WBS Description:

Detailed Design of the on board data format compression design. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 3 wks (120 hrs) @$70/hr = $8400

1.3.1.4.4	Buffers	$4,200	$4,200	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
11	*INKIND*	*4,200*	*4,200*	*0.75 days*	*3/28/03*	*4/17/03*	*$4,200*	*$4,200*	*$4,200*	*$0*

Notes

WBS Description:

Detailed design of the L1 and L2 buffers on the TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Buffers" continued

Notes

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 3 wks (8400 hrs) @$70/hr = $8400

1.3.1.4.5	VME	$2,800	$2,800	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
11	*INKIND*	*2,800*	*2,800*	*1.78 days*	*4/21/03*	*1/9/04*	*$2,800*	*$2,800*	*$2,800*	*$0*

Notes

WBS Description:

Detailed design for the TDC-VME interfaces. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 2 wks (80 hrs) @$70/hr = $5600

1.3.1.4.6	Test Paths	$1	$1	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
11	*INKIND*	*1*	*1*	*0 days*	*5/2/03*	*6/20/03*	*$1*	*$2,800*	*$1*	*$0*

Notes

WBS Description:

This task covers the cost of the board testing paths. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 3 wks (80 hrs) @$70/hr = $5600

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Test Paths" continued

Notes

1.3.1.4.7	Board Layout	$5,470	$5,470	$0	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	5,470.32	5,470.32	0 days	5/23/03	6/20/03	$5,470	$8,400	$5,470	$0

Notes

WBS Description:

This task describes the TDC board layout design. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 6wks (240 hrs) @$70/hr = $16800

1.3.1.4.8	Board Simulation	$8,400	$8,400	$0	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	8,400	8,400	0 days	7/7/03	8/29/03	$8,400	$8,400	$8,400	$0

Notes

WBS Description:

This task covers the simuation tests of the board layout and functions. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 6 wks (240 hrs) @$70/hr = $16800

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.4.9	Documentation	$7,000	$7,000	$0	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	7,000	7,000	0 days	8/18/03	9/23/03	$7,000	$7,000	$7,000	$0

Notes

WBS Description:

This task covers the cost for the documentation of the detailed design. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 5 wks (200 hrs) @$70/hr = $14000

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.4.10	Design Review	$280	$280	$0	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	280	280	0 days	7/16/03	7/16/03	$280	$280	$280	$0

Notes

WBS Description:

This milestone is a design review is for the detailed design of the TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

Note: A successful review on the "Detailed Design" means that we are ready to proceed to the prototyping phase.

M&S BOE: N/A

Labor BOE:

One day of engineer labor cost for the review meeting

100% Chicago Electrical Eng. - 1 day (8 hrs) @$70/hr = $560

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.4.11	TDC Prototype fabrication contingency task	$0	$0	$0	0	0	0
1.3.1.5	L3 TDC Design Review	$0	$0	$0	0	0	3

Notes

WBS Description:

milestone on TDC Design Review . The TDC's have been sucessfully designed and prototype board fabrication can begin.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.6	**Prototype - V1.0 (FNAL)**	**$93,919**	**$93,919**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

This summary task covers the first round of TDC prototypes including building the boards, debugging and evaulating their performance.

1.3.1.6.1	ASDQ test stand	$10,854	$10,854	$0	0.5	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	*MANDS*	*10,854.43*	*10,854.43*	*0 days*	*4/19/04*	*6/25/04*	*$10,854*	*$35,000*	*$10,854*	*$0*

Notes

WBS Description:

This task covers the cost for assemblying a teststand with VME crate and connecting it to a set of COT ASDQ boards. This will be the first true measure of timing performance using real ASDQ signals and calibration pulses. These tests will be followed by reading out the CDF full-length COT prototype chamber with prototype TDCs.

M&S BOE:
Purchase scope , dvm's etc ~ $20K
VME crate - $15K

Labor BOE: N/A

1.3.1.6.2	Develop Test Protocols	$16,800	$16,800	$0	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	*MANDSPASSL*	*16,800*	*16,800*	*0 days*	*10/22/03*	*6/28/04*	*$16,800*	*$16,800*	*$16,800*	*$0*
13	*Physicist*	*50%*	*680 hrs*	*0 days*	*10/22/03*	*6/28/04*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

Task to develop the TDC test protocols, including teststand software. The resources (money and or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 12 wks (480 hrs) @$70/hr = $33600

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.6.3	Board Fabrication	$5,055	$5,055	$0	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	*MANDSPASS*	*5,055*	*5,055*	*0 days*	*1/12/04*	*1/30/04*	*$5,055*	*$5,055*	*$5,055*	*$0*

Notes

WBS Description:

This item covers the cost of prototype TDC board fabrication

M&S BOE:

Spreadsheet of prototype assembly				
Item	Quan	Cost	Line Total	
Prototype Run I (5 copies)				$ 26,345
Board Fabrication				$ 5,055
Tooling	1	575	575	
Testing	1	850	850	
Boards	6	605	3630	
Parts				$ 19,540
FPGAs	15	1200	18000	
Connectors	50	8	400	
Panels	6	40	240	
Misc.	6	150	900	
Assembly Svcs.				$ 1,750
	5	350	1750	

FPGA cost based upon quotations. Prototype board estimates based upon experience with Run 2a calorimeter calibration card.

Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.6.4	Parts Procurement	$19,540	$19,540	$0	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	*MANDSPASS*	*19,540*	*19,540*	*0 days*	*1/12/04*	*1/30/04*	*$19,540*	*$19,540*	*$19,540*	*$0*

Notes

WBS Description:

This item covers the cost for the parts of the prototype TDC board

M&S BOE:

Spreadsheet of prototype assembly				
Item	Quan	Cost	Line Total	

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Parts Procurement" continued

Notes

Prototype Run I (5 copies)				$ 26,345
Board Fabrication				$ 5,055
Tooling	1	575	575	
Testing	1	850	850	
Boards	6	605	3630	
Parts				$ 19,540
FPGAs	15	1200	18000	
Connectors	50	8	400	
Panels	6	40	240	
Misc.	6	150	900	
Assembly Svcs.				$ 1,750
	5	350	1750	

Labor BOE: N/A

1.3.1.6.5 First Board Assembly $350 $350 $0 0.3 0 0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
10	*MANDSPASS*	*350*	*350*	*0 days*	*2/2/04*	*2/27/04*	*$350*	*$350*	*$350*	*$0*

Notes

WBS Description:

This item covers the cost for assembly of the first test board

M&S BOE:

Spreadsheet of prototype assembly				
Item	Quan	Cost	Line Total	
Prototype Run I (5 copies)				$ 26,345
Board Fabrication				$ 5,055
Tooling	1	575	575	
Testing	1	850	850	
Boards	6	605	3630	
Parts				$ 19,540
FPGAs	15	1200	18000	
Connectors	50	8	400	
Panels	6	40	240	
Misc.	6	150	900	
Assembly Svcs.				$ 1,750

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"First Board Assembly" continued

Notes

	5	350	1750	

Labor BOE: N/A

1.3.1.6.6	First Prototype TDC available for testing	$0	$0	$0	0	0	2

Notes

WBS Description:

Milestone - noting the first prototype TDC board availible for testing.

1.3.1.6.7	Bench Tests	$23,648	$23,648	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*23,648*	*23,648*	*0 days*	*3/1/04*	*4/30/04*	*$23,648*	*$23,648*	*$23,648*	*$0*
13	*Physicist*	*100%*	*360 hrs*	*0 days*	*3/1/04*	*4/30/04*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

This task covers the bench tests for the first prototype TDC board. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 8 wks (320 hrs) @$70/hr = $22400
10% Chicago Electrical Tech. - 8 wks (32 hrs) @$39/hr = $1248

1.3.1.6.8	Multiple Board Assy	$1,400	$1,400	$0	0.3	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
10	*MANDSPASS*	*1,400*	*1,400*	*0 days*	*3/22/04*	*3/31/04*	*$1,400*	*$1,400*	*$1,400*	*$0*

Notes

WBS Description:

This item covers the cost for assembly of 4 more prototype TDC boards.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Multiple Board Assy" continued

Notes

M&S BOE:

4 x $350.00 = $1400.00

Spreadsheet of prototype assembly				
Item	Quan	Cost	Line Total	
Prototype Run I (5 copies)				$ 26,345
Board Fabrication				$ 5,055
Tooling	1	575	575	
Testing	1	850	850	
Boards	6	605	3630	
Parts				$ 19,540
FPGAs	15	1200	18000	
Connectors	50	8	400	
Panels	6	40	240	
Misc.	6	150	900	
Assembly Svcs.				$ 1,750
	5	350	1750	

Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.6.9	Bench Tests (multi boards)	$5,912	$5,912	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*5,912*	*5,912*	*0 days*	*4/1/04*	*5/12/04*	*$5,912*	*$5,912*	*$5,912*	*$0*
13	*Physicist*	*100%*	*240 hrs*	*0 days*	*4/1/04*	*5/12/04*	*$0*	*$0*	*$0*	*$0*
14	*PostDoc*	*100%*	*240 hrs*	*0 days*	*4/1/04*	*5/12/04*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

This tasks covers the bench tests for the multiple prototype TDC's. The resources (money and/or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Bench Tests (multi boards)" continued

Notes

100% Chicago Electrical Eng. - 2 wks (80 hrs) @$70/hr = $5600
10% Chicago Electrical Tech. - 2 wks (8 hrs) @$39/hr = $312

1.3.1.6.11	Documentation	$9,800	$9,800	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*9,800*	*9,800*	*0 days*	*4/15/04*	*6/3/04*	*$9,800*	*$9,800*	*$9,800*	*$0*
13	*Physicist*	*50%*	*140 hrs*	*0 days*	*4/15/04*	*6/3/04*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

This item covers the documentation of prototyping and testing of the TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% Chicago Electrical Eng. - 7 wks (140 hrs) @$70/hr = $9800

1.3.1.6.12	Design Review	$560	$560	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*560*	*560*	*0 days*	*5/21/04*	*5/21/04*	*$560*	*$560*	*$560*	*$0*

Notes

WBS Description:

This milestone refers to a design review after prototyping as a requirement for the commencement of preproduction and production. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

Note: A successful review on the "Prototype-V1.0" means that we are ready to proceed to the preproduction phase

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Design Review" continued

Notes

The cost of one day labor coverage of an engineer at the review meeting

100% Chicago Electrical Eng. - 1 day (8 hrs) @$70/hr = $560

1.3.1.7	**Prototype - V1.0 (Chicago)**	**$16,803**	**$16,803**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

This summary task covers the first round of TDC prototypes including building the boards, debugging and evaulating their performance.

1.3.1.7.1	Develop Test Protocols	$16,800	$16,800	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
11	*INKIND*	*16,800*	*16,800*	*0 days*	*10/22/03*	*1/23/04*	*$16,800*	*$16,800*	*$16,800*	*$0*

Notes

WBS Description:

Task to develop the TDC test protocols, including teststand software. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 12 wks (480 hrs) @$70/hr = $33600

1.3.1.7.2	Bench Tests	$1	$1	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
11	*INKIND*	*1*	*1*	*0 days*	*3/1/04*	*4/30/04*	*$1*	*$0*	*$1*	*$0*

Notes

WBS Description:

This task covers the bench tests for the first prototype TDC board. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Bench Tests" continued

Notes

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 8 wks (320 hrs) @$70/hr = $22400

1.3.1.7.3	Bench Tests (multi boards)	$1	$1	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
11	*INKIND*	*1*	*1*	*0 days*	*4/1/04*	*5/12/04*	*$1*	*$0*	*$1*	*$0*

Notes

WBS Description:

This tasks covers the bench tests for the multiple prototype TDC's. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

100% Chicago Electrical Eng. - 2 wks (80 hrs) @$70/hr = $5600

1.3.1.7.5	Documentation	$1	$1	$0	1	1	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
11	*INKIND*	*1*	*1*	*0 days*	*4/15/04*	*6/24/04*	*$1*	*$0*	*$1*	*$0*

Notes

WBS Description:

This item covers the documentation of prototyping and testing of the TDC boards. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

50% Chicago Electrical Eng. - 7 wks (140 hrs) @$70/hr = $9800

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Documentation" continued

Notes

1.3.1.7.6	Design Review	$0	$0	$0	1	1	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	0	0	0 days	5/21/04	5/21/04	$0	$0	$0	$0

Notes

WBS Description:

This milestone refers to a design review after prototyping as a requirement for the commencement of preproduction and production. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

Note: A successful review on the "Prototype-V1.0" means that we are ready to proceed to the preproduction phase

M&S BOE: N/A

Labor BOE:

The cost of one day labor coverage of an engineer at the review meeting

100% Chicago Electrical Eng. - 1 day (8 hrs) @$70/hr = $560

1.3.1.8	L3 Design Review Milestone	$0	$0	$0	0	0	3

Notes

WBS Description:

Milestone - completion of TDC design review after prototyping as a requirment for the commencement of preproduction and production

1.3.1.9	**Preproduction**	**$171,806**	**$140,061**	**$31,745**	**0**	**0**	**0**

Notes

WBS Description:

This summary task covers preproduction TDC board fabrication and performance testing with single and multiple boards.

1.3.1.9.3	Production test equipment	$40,000	$40,000	$0	0.5	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	40,000	40,000	0 days	12/6/04	12/10/04	$40,000	$40,000	$40,000	$0

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Production test equipment" continued

Notes

WBS Description:

This item coves the cost for equipment for testing/debugging TDC boards

M&S BOE:

test equipment for testing/debugging the new board
logic analyzer and various other apparatus - $40K

Labor BOE: N/A

1.3.1.9.4	Layout Modification	$4,410	$4,410	$0	0.5	0.5	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*4,410*	*4,410*	*0 days*	*5/24/04*	*7/30/04*	*$4,410*	*$8,400*	*$4,410*	*$0*

Notes

WBS Description:

This task covers the modification of the TDC board layout after prototyping. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

0.5 X $70/hr X 10.5w X 12 hr/wk = $4410

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.9.5	Board Fabrication	$5,297	$5,297	$0	0.3	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*5,297*	*5,297*	*0 days*	*8/10/04*	*8/30/04*	*$5,297*	*$5,297*	*$5,297*	*$0*

Notes

WBS Description:

This task covers the cost of fabrication of the preproduction TDC boards

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Board Fabrication" continued

Notes

Note: We assume we still need the cost of "tooling/testing" after some moderate rework of design.

M&S BOE:
Note all the cost of Board Fabrication and assembly (since it is done at one vendor)
for WBS 1.3.1.9.5, 1.3.1.9.7 and 1.3.1.9.9 will be in 1.3.1.9.5 - new cost $15,925

MANDS cost increased to $15925

New Estimate Peter Wilson Aug '04

Parts Vendor	**$ for 35 sets**	**Per Board**	**$ for 35**
Arrow (Incl FPGAs)	48,792.72		
Cool Innovations	462.50		
DDD	3,774.00		
Datel	4,610.20		
Taylor (Elma)	321.10		
Avnet	1,757.80		
Digikey	1,144.26		
Newark	3,555.59		
Parts Subtotal (35 sets)	64,418.16	1,840.52	64,418.16
Front Panel		30.00	1,050.00
(Estimate from 2003 $19-22 each)			
Stiffener		13.00	455.00
(1999 PO for 400 @ $6.5, 2003 PO for 50 @$13)			
Parts Total (WBS 1.3.1.9.6)		1,883.52	65,923.16
Fabrication & Ass. (WBS 1.3.9.5 & .7 & .9)		455.00	**15,925.00**
(Altron PO + 10% for misc. additional charges (eg Tape and reel))			
Total (w/o spare parts)		2,338.52	81,848.16

Old Estimate -

Item	Quan	Cost	Line Total	
PreProduction Run (20 copies)				
Board Fabrication				$ 5,297
Tooling	1	575	575	
Testing	1	850	850	
Boards	22	176	3872	
Parts				$ 50,080
FPGAs	45	1000	45000	
Connectors	160	8	1280	
Panels	20	40	800	
Misc.	20	150	3000	
Assembly Svcs.				$ 3,000
	20	150	3000	

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Board Fabrication" continued

Notes

Labor BOE: N/A

1.3.1.9.6	Parts Procurement	$50,800	$50,800	$0	0.3	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*50,800*	*50,800*	*0 days*	*6/4/04*	*8/27/04*	*$50,800*	*$50,800*	*$50,800*	*$0*

Notes

WBS Description:

This item covers the cost for the parts required for the preproduction TDC boards

M&S BOE:
Note all the cost of Board Fabrication and assembly (since it is done at one vendor)
for WBS 1.3.1.9.5, 1.3.1.9.7 and 1.3.1.9.9 will be in 1.3.1.9.5 -

MANDS cost increased to $66,925

New Estimate Peter Wilson Aug '04

Parts Vendor	**$ for 35 sets**	**Per Board**	**$ for 35**
Arrow (Incl FPGAs)	48,792.72		
Cool Innovations	462.50		
DDD	3,774.00		
Datel	4,610.20		
Taylor (Elma)	321.10		
Avnet	1,757.80		
Digikey	1,144.26		
Newark	3,555.59		
Parts Subtotal (35 sets)	64,418.16	1,840.52	64,418.16
Front Panel		30.00	1,050.00
(Estimate from 2003 $19-22 each)			
Stiffener		13.00	455.00
(1999 PO for 400 @ $6.5, 2003 PO for 50 @$13)			
Parts Total (WBS 1.3.1.9.6)		1,883.52	**65,923.16**
Fabrication & Ass. (WBS 1.3.9.5 & .7 & .9)		455.00	15,925.00
(Altron PO + 10% for misc. additional charges (eg Tape and reel))			
Total (w/o spare parts)		2,338.52	81,848.16

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Parts Procurement" continued

Notes

Old Estimate:

Item	Quan	Cost	Line Total	
PreProduction Run (20 copies)				
Board Fabrication				$ 5,297
Tooling	1	575	575	
Testing	1	850	850	
Boards	22	176	3872	
Parts				$ 50,080
FPGAs	45	1000	45000	
Connectors	160	8	1280	
Panels	20	40	800	
Misc.	20	150	3000	
Assembly Svcs.				$ 3,000
	20	150	3000	

Labor BOE: N/A

1.3.1.9.7 First Board Assembly $150 $150 $0 0.3 0 0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*150*	*150*	*0 days*	*8/31/04*	*9/20/04*	*$150*	*$150*	*$150*	*$0*

Notes

WBS Description:

This item covers the cost for the assembly of the first preproduction TDC board

M&S BOE:
Note all the cost of Board Fabrication and assembly (since it is done at one vendor)
for WBS 1.3.1.9.5, 1.3.1.9.7 and 1.3.1.9.9 will be in 1.3.1.9.5 -

MANDS cost reduced to $0

New Estimate Peter Wilson Aug '04

Parts Vendor	**$ for 35 sets**	**Per Board**	**$ for 35**
Arrow (Incl FPGAs)	48,792.72		
Cool Innovations	462.50		
DDD	3,774.00		

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"First Board Assembly" continued

Notes

Datel	4,610.20		
Taylor (Elma)	321.10		
Avnet	1,757.80		
Digikey	1,144.26		
Newark	3,555.59		
Parts Subtotal (35 sets)	64,418.16	1,840.52	64,418.16
Front Panel		30.00	1,050.00
(Estimate from 2003 $19-22 each)			
Stiffener		13.00	455.00
(1999 PO for 400 @ $6.5, 2003 PO for 50 @$13)			
Parts Total (WBS 1.3.1.9.6)		1,883.52	65,923.16
Fabrication & Ass. (WBS 1.3.9.5 & .7 & .9)		455.00	**15,925.00**
(Altron PO + 10% for misc. additional charges (eg Tape and reel))			
Total (w/o spare parts)		2,338.52	81,848.16

Old estimate:

Item	Quan	Cost	Line Total	
PreProduction Run (20 copies)				
Board Fabrication				$ 5,297
Tooling	1	575	575	
Testing	1	850	850	
Boards	22	176	3872	
Parts				$ 50,080
FPGAs	45	1000	45000	
Connectors	160	8	1280	
Panels	20	40	800	
Misc.	20	150	3000	
Assembly Svcs.				$ 3,000
	20	150	3000	

Parts cost dominated by FPGAs and connectors.

Labor BOE: N/A

1.3.1.9.8	Bench Tests(first board)	$6,357	$1,624	$4,733	0.5	0.5	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
3	*CompProfF*	*20%*	*46.4 hrs*	*0 days*	*9/21/04*	*10/29/04*	*$2,181*	*$0*	*$2,181*	*$0*
4	*ElecEngF*	*20%*	*46.4 hrs*	*0 days*	*9/21/04*	*10/29/04*	*$2,552*	*$0*	*$2,552*	*$0*
8	*StudentU*	*100%*	*232 hrs*	*0 days*	*9/21/04*	*10/29/04*	*$0*	*$0*	*$0*	*$0*

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Bench Tests(first board)" continued

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,624	1,624	0 days	9/20/04	10/29/04	$1,624	$0	$1,624	$0
13	Physicist	50%	116 hrs	0 days	9/21/04	10/29/04	$0	$0	$0	$0
14	PostDoc	25%	58 hrs	0 days	9/21/04	10/29/04	$0	$0	$0	$0
18	Bogdan	20%	46.4 hrs	0 days	9/21/04	10/29/04	$0	$0	$0	$0
19	Chappa	20%	46.4 hrs	0 days	9/21/04	10/29/04	$0	$0	$0	$0
21	Klein	20%	46.4 hrs	0 days	9/21/04	10/29/04	$0	$0	$0	$0

Notes

WBS Description:

This item covers the cost for the bench tests of the first preproduction TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

20% U of C Engineer (Averaged over entire period)

0.5 x $70/hr x (48 hrs = 6w X 0.2 x 40hr/wk) = $1680
Mircea Bogdan

FNAL Elec Eng (Steve Chappa) = 20% FTE
FNAL Comp Prof (Rod Klein) = 20% FTE

Chicago Student = 50% FTE
PostDoc (TAMU) = 25%
TAMU Student = 25%
Physicist = 50%

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

1.3.1.9.9	Multiple Board Assy	$25,600	$25,600	$0	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	25,600	25,600	0 days	10/19/04	11/15/04	$25,600	$2,850	$25,600	$0

Notes

WBS Description:

This task covers the cost for the assembly of 19 preproduction TDC boards.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Multiple Board Assy" continued

Notes

M&S BOE:
Note all the cost of Board Fabrication and assembly (since it is done at one vendor) for WBS 1.3.1.9.5, 1.3.1.9.7 and 1.3.1.9.9 will be in 1.3.1.9.5 -

Modified to cover the costs from WBS 1.3.1.9.5, 1.3.1.9.6, 1.3.1.9.7 and 1.3.1.9.9
1.3.1.9.5-1.3.1.9.7 100% complete

New Estimate Peter Wilson Aug '04

Parts Vendor	**$ for 35 sets**	**Per Board**	**$ for 35**
Arrow (Incl FPGAs)	48,792.72		
Cool Innovations	462.50		
DDD	3,774.00		
Datel	4,610.20		
Taylor (Elma)	321.10		
Avnet	1,757.80		
Digikey	1,144.26		
Newark	3,555.59		
Parts Subtotal (35 sets)	64,418.16	1,840.52	64,418.16
Front Panel		30.00	1,050.00
(Estimate from 2003 $19-22 each)			
Stiffener		13.00	455.00
(1999 PO for 400 @ $6.5, 2003 PO for 50 @$13)			
Parts Total (WBS 1.3.1.9.6)		1,883.52	65,923.16
Fabrication & Ass. (WBS 1.3.9.5 & .7 & .9)		455.00	**15,925.00**
(Altron PO + 10% for misc. additional charges (eg Tape and reel))			
Total (w/o spare parts)		2,338.52	81,848.16

Old Estimate:
19 x $150 = $2850 (note: M&S here only covers assembly. Parts, board fabrication and NRE covered in previous items.)

Labor BOE: N/A

1.3.1.9.10	Bench Tests (multi board)	$19,560	$4,200	$15,360	0.5	0.5	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
4	*ElecEngF*	*0%*	*0 hrs*	*0 days*	*11/16/04*	*11/16/04*	*$0*	*$0*	*$0*	*$0*
12	*MANDSPASSL*	*0*	*0*	*0 days*	*11/16/04*	*11/16/04*	*$0*	*$0*	*$0*	*$0*
13	*Physicist*	*200%*	*960 hrs*	*0 days*	*11/16/04*	*2/16/05*	*$0*	*$0*	*$0*	*$0*

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Bench Tests (multi board)" continued

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
18	Bogdan	10%	48 hrs	0 days	11/16/04	2/16/05	$0	$0	$0	$0
19	Chappa	10%	48 hrs	0 days	11/16/04	2/16/05	$0	$0	$0	$0

Notes

WBS Description:

This task describes the bench tests for the multiple preproduction TDC boards. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

12-Aug-04 Mandspassl reduced to $0 from $1120

Labor BOE:

10% of Electrical Engineer from U of Chicago 8 wks (40 hrs) @ $70/hr

0.5 (Reimbursement) x 0.1 (FTE) x $70/hr X 40hrs/wk X 8 wks = $1120

10% of Electrical Engineer of Fermilab (Chappa)

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.9.10.1	Preproduction TDC board checkout	$3,120	$0	$3,120	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
5	ElecTechF	50%	80 hrs	0 days	11/16/04	12/15/04	$3,120	$0	$3,120	$0

Notes

WBS Description:

Checkout of individual boards will be carried out at Fermilab using Rod Kleins code. Do both internal memory pulsing test and external ASDQ - Month of November

Labor BOE PPD Tech 50%

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.9.10.2	Preproduction multi board Crate tests at FNAL	$12,240	$0	$12,240	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
3	CompProfF	25%	120 hrs	0 days	11/16/04	2/16/05	$5,640	$0	$2,914	$2,726
4	ElecEngF	25%	120 hrs	0 days	11/16/04	2/16/05	$6,600	$0	$3,410	$3,190
13	Physicist	200%	960 hrs	0 days	11/16/04	2/16/05	$0	$0	$0	$0
19	Chappa	25%	120 hrs	0 days	11/16/04	2/16/05	$0	$0	$0	$0
33	klei	25%	120 hrs	0 days	11/16/04	2/16/05	$0	$0	$0	$0

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Preproduction multi board Crate tests at FNAL" continued

Notes

WBS Description:

1. Complete assembly and testing of 35 PreProduction boards.
o Motivation: We would like to carry the project through to the point of demonstrating the operation of a full crate of boards together. In addition, there will be only a small financial benefit from canceling the assembly of the remaining 30 boards since the PCBs have been fabricated and the cost of restocking parts would be substantial fraction of their value. Some parts cannot be restocked since they were purchased on a no return basis.
o Assembly should be completed by November 5
o Checkout of individual boards will be carried out at Fermilab using Rod Kleins code. Do both internal memory pulsing test and external ASDQ pulsing tests. Assume completion by November 29.
o Initial test of full crate of cards to be done on the 14th floor to make sure there are no gross problems.
o First test of a full crate test in test stand at CDF either in Diagnostic crate in trigger room or in test stand room. Control via run control and readout using readout code by Badgett. (How mush is needed to make this happen?) Run all cards doing internal pulsing test and check validity of data and synchronicity of Bunch counters. Would like to run ~1Million events. This test to be done using regular block transfer and 32bit data width. Use readout code from Bill Badgett.
o Test of full crate of boards using 64 bit CBLT using test code at Chicago. Goal here is to demonstrate 64 bit CBLT and measure the bandwidth capabilities of this operation.
o No test in COT crates on the detector would take place.
o No additional development of firmware for the XFT outputs will take place.
o No additional development of other firmware except that needed to complete the listed tests.
o Resources needed: Rod Klein (25% averaged over next 3 months), PPD Technician for checkout (50% for month of November), Steve Chappa (25% avergaed over next 3 months), Assistance from DAQ group for full crate in B0, Physicists for B0 test (TA&M, Duke, Fermilab). For Chicago test need Mircea Bodan and Sasha Pamarov.
o Schedule: complete full crate tests by end of January 2005. Need a clear set of goals that are achievable on this sort of time scale. Ultimately it is assumed that results will be included in a NIM article on the TDC design.

1.3.1.9.10.3	Preprod TDC board - 64 bit CBLT (@ Chicago)	$4,200	$4,200	$0	0.5	0.5	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*4,200*	*4,200*	*0 days*	*11/16/04*	*2/16/05*	*$4,200*	*$0*	*$2,170*	*$2,030*
13	*Physicist*	*50%*	*240 hrs*	*0 days*	*11/16/04*	*2/16/05*	*$0*	*$0*	*$0*	*$0*
18	*Bogdan*	*25%*	*120 hrs*	*0 days*	*11/16/04*	*2/16/05*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

1. Complete assembly and testing of 35 PreProduction boards.
o Motivation: We would like to carry the project through to the point of demonstrating the operation of a full crate of boards together. In addition, there will be only a small financial benefit from canceling the assembly of the remaining 30 boards since the PCBs have been fabricated and the cost of restocking parts would be substantial

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Preprod TDC board - 64 bit CBLT (@ Chicago)" continued

Notes

fraction of their value. Some parts cannot be restocked since they were purchased on a no return basis.
o Assembly should be completed by November 5
o Checkout of individual boards will be carried out at Fermilab using Rod Kleins code. Do both internal memory pulsing test and external ASDQ pulsing tests. Assume completion by November 29.
o Initial test of full crate of cards to be done on the 14th floor to make sure there are no gross problems.
o First test of a full crate test in test stand at CDF either in Diagnostic crate in trigger room or in test stand room. Control via run control and readout using readout code by Badgett. (How mush is needed to make this happen?) Run all cards doing internal pulsing test and check validity of data and synchronicity of Bunch counters. Would like to run ~1Million events. This test to be done using regular block transfer and 32bit data width. Use readout code from Bill Badgett.
o Test of full crate of boards using 64 bit CBLT using test code at Chicago. Goal here is to demonstrate 64 bit CBLT and measure the bandwidth capabilities of this operation.
o No test in COT crates on the detector would take place.
o No additional development of firmware for the XFT outputs will take place.
o No additional development of other firmware except that needed to complete the listed tests.
o Resources needed: Rod Klein (25% averaged over next 3 months), PPD Technician for checkout (50% for month of November), Steve Chappa (25% avergaed over next 3 months), Assistance from DAQ group for full crate in B0, Physicists for B0 test (TA&M, Duke, Fermilab). For Chicago test need Mircea Bodan and Sasha Pamarov.
o Schedule: complete full crate tests by end of January 2005. Need a clear set of goals that are achievable on this sort of time scale. Ultimately it is assumed that results will be included in a NIM article on the TDC design.

Labor BOE

U of C Engineer - Mircea Bogdan 25%

0.5 x $70/hr x 120 hrs (= 0.25 FTE x 12wks x 40hrs/wk) = $4200

1.3.1.9.12	Documentation	$0	$0	$0	0.5	0.5	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*0*	*0*	*0 days*	*10/18/04*	*10/18/04*	*$0*	*$0*	*$0*	*$0*
13	*Physicist*	*10%*	*48 hrs*	*0 days*	*10/19/04*	*1/19/05*	*$0*	*$0*	*$0*	*$0*
18	*Bogdan*	*10%*	*48 hrs*	*0 days*	*10/19/04*	*1/19/05*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

This item covers the costs associated with the documentation of the preproduction boards and testing. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

10% of Electrical Engineer of U of Chicago 12 weeks (48h) @ $70/hr

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Documentation" continued

Notes

0.5 (Reimbursement) X 0.10 (FTE) X $70/hr X 40 hrs/wk X 12 wks = $1680

Labor estimated based upon recent experience with systems of similar scope, including the CDF Run 2a TDC, trigger and calorimeter systems.

11-Aug-04 - Mandspassl set to $0 from $1680

1.3.1.9.14	Bid documentation	$0	$0	$0	0	0	0
1.3.1.9.16	**Build Test Pattern Card**	**$11,940**	**$7,980**	**$3,960**	**0**	**0**	**0**
1.3.1.9.16.1	Specification of Pattern Card	$3,960	$0	$3,960	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
4	*ElecEngF*	*20%*	*72 hrs*	*0 days*	*6/8/04*	*8/10/04*	*$3,960*	*$3,960*	*$3,960*	*$0*
19	*Chappa*	*20%*	*7.2 hrs*	*41.5 days*	*8/5/04*	*8/11/04*	*$0*	*$0*	*$0*	*$0*

Notes

Labor BOE: Steve Chappa writing specification EEF @ 20%

1.3.1.9.16.2	Pattern Card schematics	$7,000	$7,000	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*7,000*	*7,000*	*0 days*	*8/2/04*	*8/13/04*	*$7,000*	*$1,400*	*$7,000*	*$0*
18	*Bogdan*	*50%*	*196 hrs*	*1 day*	*8/3/04*	*10/11/04*	*$0*	*$0*	*$0*	*$0*

Notes

Labor BOE: Chicago Elelctrical Engineer (Mircea Bogdan) 50% of his time at a pay rate of $70 per hour. We pay 1/2 the cost. (0.5)

0.5 X $70/hr X 8 weeks X 20 hrs/wk = $7000

1.3.1.9.16.11	Firmware for Pattern Card	$980	$980	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
4	*ElecEngF*	*50%*	*0 hrs*	*0 days*	*8/25/04*	*9/28/04*	*$0*	*$0*	*$0*	*$0*
12	*MANDSPASSL*	*980*	*980*	*0 days*	*8/25/04*	*10/1/04*	*$980*	*$0*	*$980*	*$0*
18	*Bogdan*	*100%*	*41.37 hrs*	*0 days*	*8/25/04*	*10/1/04*	*$0*	*$0*	*$0*	*$0*
19	*Chappa*	*100%*	*78.8 hrs*	*0 days*	*8/25/04*	*10/1/04*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

Develop firmware for Test Pattern Card

M&S BOE: UC Electrical Engineer (M. Bogdan) at 10% paid for with M&S Pass money = $980

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Firmware for Pattern Card" continued

Notes

Labor BOE: Manpower = 1/2 FTE from FNAL (S.Chappa) + 10% FTE from UC (M. Bogdan)

0.5 X $70/hr X 28 hrs (= 0.1 FTE x 7w X 40hrs) = $980

1.3.1.9.19	Test Software	$6,768	$0	$6,768	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
3	*CompProfF*	*20%*	*144 hrs*	*0 days*	*6/28/04*	*11/2/04*	*$6,768*	*$9,024*	*$6,768*	*$0*
8	*StudentU*	*50%*	*360 hrs*	*0 days*	*6/28/04*	*11/2/04*	*$0*	*$0*	*$0*	*$0*
21	*Klein*	*20%*	*144 hrs*	*0 days*	*6/28/04*	*11/2/04*	*$0*	*$0*	*$0*	*$0*

Notes

This task describes the software needed for testing the Preproduction and Production TDC's
This software will control the test pattern card

Labor BOE:

FNAL Comp Prof (Rod Klien) = 20% FTE

University Student - 50% FTE

1.3.1.9.20	Preproduction Firmware	$924	$0	$924	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	*ElecEngF*	*10%*	*16.8 hrs*	*0 days*	*5/21/04*	*6/21/04*	*$924*	*$0*	*$924*	*$0*
12	*MANDSPASSL*	*0*	*0*	*0 days*	*5/21/04*	*5/21/04*	*$0*	*$0*	*$0*	*$0*
19	*Chappa*	*10%*	*91.2 hrs*	*0 days*	*5/21/04*	*11/2/04*	*$0*	*$0*	*$0*	*$0*

Notes

Firmware development for Preproduction boards:
1) XFT output flag design
2) Implement VME 64 readout

Labor BOE:

U of Chicago EE (Mircea Bogdan/ Harold Sanders/ Mary ????)

FNAL EE (Steve Chappa) = % FTE
0.5 X $70/hr X 29 wks X 10 hrs/wk = $10150

11-Aug-04 - Mandspassl set to $0 from $10,150
11-Aug-04 - ElecEngF set to 0% from 10%

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.1.17	**TDC Readout System**	**$122,485**	**$122,485**	**$0**	**0**	**0**	**0**
1.3.1.17.1	**Preproduction Readout**	**$9,985**	**$9,985**	**$0**	**0**	**0**	**0**
1.3.1.17.1.1	System architecture	$0	$0	$0	0	0	0
1.3.1.17.1.2	Evaluation of Crate Processor	$0	$0	$0	0	0	0
1.3.1.17.1.3	Order preproduction Crate Processor	$9,985	$9,985	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*9,985*	*9,985*	*0 days*	*4/26/04*	*6/14/04*	*$9,985*	*$9,985*	*$9,985*	*$0*

Notes

M&S BOE:

-Crate processor (MVME5500) = $3500 X 3 = $10.5K **($9,985 in FY02 dollars)**

Labor BOE: N/A

1.3.1.17.2	**Production Readout**	**$112,500**	**$112,500**	**$0**	**0**	**0**	**0**
1.3.1.17.2.1	Order production Crate Processor	$112,500	$112,500	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
1	*PhysicistF*	*20%*	*72 hrs*	*0 days*	*10/7/04*	*12/10/04*	*$0*	*$0*	*$0*	*$0*
9	*MANDS*	*112,500*	*112,500*	*0 days*	*10/7/04*	*12/10/04*	*$112,500*	*$112,500*	*$112,500*	*$0*

Notes

M&S BOE:

-Crate processor (MVME5500) = $3500 X 25 = $87.5K **($83,207 in FY02 dollars)**

-Cables,withches and misc. =$5K **($4,755 in FY02 dollars)**

-Software license (vxWorks) = $20K (for two copies) **($19,091 in FY02 dollars)**

-Total cost = $112.5K **($107,052 in FY02 dollars)**

Labor BOE: Manpower =1 physicist

1.3.1.17.3	L3MS: TDC Readout System Complete	$0	$0	$0	0	0	3
1.3.1.17.4	TDC Readout System Complete	$0	$0	$0	0	0	2

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
"TDC Readout System Complete" continued							
1.3.2	**Run 2b Level 2 Project**	**$325,216**	**$275,320**	**$49,896**	**0**	**0**	**0**

Notes
WBS Description: This summary task covers the development and production of the Level 2 Trigger system

1.3.2.1	L3 Start of Run 2b Level 2 Project	$0	$0	$0	0	0	3

Notes
WBS Description: Milestone denoting the start of the Level 2 Trigger Project

1.3.2.2	Testing and Software work existing L2 Pulsar test stand	$0	$0	$0	0	0.5	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
13	*Physicist*	*150%*	*768 hrs*	*16 days*	*9/27/02*	*1/2/03*	*$0*	*$0*	*$0*	*$0*
14	*PostDoc*	*250%*	*1,280 hrs*	*16 days*	*9/27/02*	*1/2/03*	*$0*	*$0*	*$0*	*$0*

Notes
WBS Description:The prototype Pulsar board will be commissioned as part of a test stand for the Run 2A system. Specific tasks are: finish all mezzanine/Aux cards, Pulsar prototype testing, Rev B if needed; SLINK to PCI software work, test stand software, additional firmware work for testing ALL basic functionalities of prototypes

M&S BOE: N/A

Labor BOE: Based on Run 2A experience

1.3.2.3	Commission L2 Pulsar for each data path - proof of principle tes	$0	$0	$0	0	0.5	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
13	*Physicist*	*150%*	*2,040 hrs*	*0 days*	*1/3/03*	*9/3/03*	*$0*	*$0*	*$0*	*$0*
14	*PostDoc*	*50%*	*680 hrs*	*0 days*	*1/3/03*	*9/3/03*	*$0*	*$0*	*$0*	*$0*

Notes
WBS Description:The Pulsar board will be commissioned for each data path coming in to and out of the Level 2 decision system.

M&S BOE: N/A

Labor BOE: Based on Run 2A experience.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.2.4	**Preproduction run of Pulsar L2 system**	**$145,516**	**$145,516**	**$0**	**0**	**0**	**0**

Notes

WBS Description: This task covers the preproduction run of the Level 2 system, which consists of three Pulsar boards, associated mezzanine cards, S-link boards and interface hardware, and L2 decision processor, and will be configured for a vertical slice test.

1.3.2.4.1	Preproduction Pulsar L2 system schedule contingency task	$0	$0	$0	0	0	0
1.3.2.4.2	Preproduction Readiness Review Pulsar L2 system	$0	$0	$0	0	0	0

Notes

WBS Description: This milestone refers to a review of the results from commissioning the prototype Pulsar in teststand and for all data paths in preparation for preproduction

M&S BOE: N/A

Labor BOE:

1.3.2.4.3	Engineering on preproduction L2 system (FNAL)					$11,200	$11,200	$0	0.2	0.2	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*11,200*	*11,200*	*0 days*	*9/19/03*	*11/13/03*	*$11,200*	*$11,200*	*$11,200*	*$0*

Notes

WBS Description:

This item covers engineering modifications for the L2 system based on prototype Pulsar commissioning. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 2 mon = 8 weeks (320 hrs) @ $70/hr

Based on information from Run 2a - Pulsar test stand quotes			
Engineering	Quan	Cost	Total
2 months	2	$10,000.00	$20,000.00

U of C rate (as of Summer '02) $55.25/hr

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.2.4.4	Engineering on preproduction L2 system (Chicago)	$11,200	$11,200	$0	0.2	0.2	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	11,200	11,200	0 days	9/19/03	11/13/03	$11,200	$11,200	$11,200	$0

Notes

WBS Description:

This item covers engineering modifications for the L2 system based on prototype Pulsar commissioning.
The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:

100% of 1 Electrical Engineering from U of Chicago - 2 mon = 8 weeks (320 hrs) @ $70/hr

Based on information from Run 2a - Pulsar test stand quotes			
Engineering	Quan	Cost	Total
2 months	2	$10,000.00	$20,000.00

U of C rate (as of Summer '02) $55.25/hr

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.2.4.5	Motherboards Fabrication	$18,600	$18,600	$0	0.15	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	18,600	18,600	0 days	7/14/03	1/12/04	$18,600	$18,600	$18,600	$0

Notes

WBS Description: This item covers the cost of components and fabrication for three Pulsar motherboards for the preproduction run.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
Motherboard Fabrication	Quan	Cost	Total
Boards	3	$6,200.00	$18,600.00

Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.2.4.6	Mezzanine boards Fabrication	$13,000	$13,000	$0	0.15	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	13,000	13,000	0 days	7/14/03	8/25/03	$13,000	$13,000	$13,000	$0

Notes

WBS Description: This item covers the cost of fabrication and components for 20 mezzanine cards for the preproduction run.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
Mezzanine board fabrication	Quan	Cost	Total
Boards	20	$650.00	$13,000.00

Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.2.4.7	S-link Auxiliary boards	$900	$900	$0	0.15	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	900	900	0 days	7/14/03	8/22/03	$900	$900	$900	$0

Notes

WBS Description: This item covers the fabrication and component costs for three S-Link boards for preproduction.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
S-link Auxiliary board	Quan	Cost	Total
Boards	3	$300.00	$900.00

Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.2.4.8	LSC/LDL + fiber boards	$6,828	$6,828	$0	0.15	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	6,828	6,828	0 days	7/14/03	8/26/03	$6,828	$6,828	$6,828	$0

Notes

WBS Description: This item covers the cost of purchasing three Link Source Cards / Link Destination Cards and fibers for preproduction.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"LSC/LDL + fiber boards" continued

Notes

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
LSC/LDL + fiber	Quan	Cost	Total
Boards	3	$2,276.00	$6,828.00

Labor BOE: N/A

1.3.2.4.9 PCI-> S-link boards $2,574 $2,574 $0 0.15 0 0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*2,574*	*2,574*	*0 days*	*7/14/03*	*8/26/03*	*$2,574*	*$2,574*	*$2,574*	*$0*

Notes

WBS Description:This item covers the cost of purchasing three PCI -> S-Link interface boards for preproduction.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
PCI->S-link	Quan	Cost	Total
Boards	3	$858.00	$2,574.00

Labor BOE: N/A

1.3.2.4.10 S-link -> PCI boards $3,213 $3,213 $0 0.15 0 0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*3,213*	*3,213*	*0 days*	*7/14/03*	*8/22/03*	*$3,213*	*$3,213*	*$3,213*	*$0*

Notes

WBS Description:This item covers the cost of purchasing three S-Link -> PCI boards for preproduction.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
S-link -> PCI	Quan	Cost	Total
Boards	3	$1,071.00	$3,213.00

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"S-link -> PCI boards" continued

Notes

Labor BOE: N/A

1.3.2.4.11	L2 decision processor	$8,000	$8,000	$0	0.15	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*8,000*	*8,000*	*0 days*	*7/14/03*	*1/27/04*	*$8,000*	*$8,000*	*$8,000*	*$0*

Notes

WBS Description:This item covers the cost of purchasing two PC's for use as the L2 decision processor for preproduction.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
L2 decision processor	Quan	Cost	Total
PC	2	$4,000.00	$8,000.00

Labor BOE: N/A

1.3.2.4.12	software development/memory management (FNAL)	$70,000	$70,000	$0	0.2	0.2	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*70,000*	*70,000*	*0 days*	*9/19/03*	*12/20/04*	*$70,000*	*$70,000*	*$70,000*	*$0*

Notes

WBS Description:

This item covers the engineering required to design and develop the Level 2 decision system software/memory management.
The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: NA

Labor BOE: Based on Run 2A experience

50% of 1 Electrical Engineering from U of Chicago - 50 weeks (1000 hrs) @ $70/hr

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.2.4.13	software development/memory management (Chicago)	$1	$1	$0	0.2	0.2	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
11	INKIND	1	1	0 days	9/19/03	8/27/04	$1	$1	$1	$0

Notes

WBS Description:

This item covers the engineering required to design and develop the Level 2 decision system software/memory management. The In-Kind resources (money and /or labor) provided by Univ. of Chicago are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: NA

Labor BOE: Based on Run 2A experience

50% of 1 Electrical Engineering from U of Chicago - 50 weeks (1000 hrs) @ $70/hr

1.3.2.5	Vertical Slice Test	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
13	Physicist	150%	1,200 hrs	0 days	1/27/04	6/16/04	$0	$0	$0	$0
14	PostDoc	50%	400 hrs	0 days	1/27/04	6/16/04	$0	$0	$0	$0

Notes

WBS Description: This item covers assembly of a vertical slice of the Level 2 system. Specific tasks include: use test stand to fine tune receiver firmware for each data path; system integration at crate level with test stand; L2 code testing for new system.

M&S BOE: N/A

Labor BOE: Based on Run 2A experience

1.3.2.6	**Production run of Pulsar L2 system**	**$129,804**	**$129,804**	**$0**	**0**	**0**	**0**

Notes

WBS Description: Summary task for Production Run of Pulsar Level 2 system: fabrication and purchase of boards, link hardware, L2 decision processors.

1.3.2.6.1	L3 Production Readiness Review for Level 2 Pulsar system	$0	$0	$0	0	0	3

Notes

WBS Description: This milestone refers to a review of the preproduction tests / vertical slice results in preparation for the production run.

M&S BOE: N/A

Labor BOE:

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.2.6.3	Begin production of Level2 Pulsar system	$0	$0	$0	0	0	2

Notes

WBS Description:

Milestone denoting beginning of production of Level 2 system.

1.3.2.6.4	L2 Pulsar system - schedule contingency task	$0	$0	$0	0	0	0
1.3.2.6.5	Motherboards Fabrication	$80,600	$80,600	$0	0.15	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*80,600*	*80,600*	*0 days*	*3/16/04*	*5/10/04*	*$80,600*	*$80,600*	*$80,600*	*$0*

Notes

WBS Description:This item covers the cost of components and fabrication for 13 Pulsar motherboards for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
Motherboard Fabrication	Quan	Cost	Total
Boards	13	$6,200.00	$80,600.00

Labor BOE: N/A

1.3.2.6.6	L3 Mezzanine boards Fabrication	$0	$0	$0	0.15	0	3

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*0*	*0*	*0 days*	*9/5/03*	*9/5/03*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description: This item covers the cost of components and fabrication of 50 mezzanine cards for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
Mezzanine board fabrication	Quan	Cost	Total
Boards	50	$650.00	$32,500.00

Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.2.6.7	S-link Auxiliary boards	$3,900	$3,900	$0	0.15	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	3,900	3,900	0 days	9/22/03	10/31/03	$3,900	$3,900	$3,900	$0

Notes

WBS Description: This item covers the cost of components and fabrication for 13 S-Link Auxilliary boards for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
S-link Auxiliary board	Quan	Cost	Total
Boards	13	$300.00	$3,900.00

Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.2.6.8	LSC/LDL + fiber boards	$29,588	$29,588	$0	0.15	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	29,588	29,588	0 days	10/6/03	2/2/04	$29,588	$29,588	$29,588	$0

Notes

WBS Description: This item covers the cost of purchasing 13 Link Source Card/ Link Destination Cards and fibers for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
LSC/LDL + fiber	Quan	Cost	Total
Boards	13	$2,276.00	$29,588.00

Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.2.6.9	PCI-> S-link boards	$3,432	$3,432	$0	0.15	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	3,432	3,432	0 days	10/31/03	2/2/04	$3,432	$3,432	$3,432	$0

Notes

WBS Description: This item covers the cost of purchasing 4 PCI -> S-link boards for the production system.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"PCI-> S-link boards" continued

Notes

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
PCI->S-link	Quan	Cost	Total
Boards	4	$858.00	$3,432.00

Labor BOE: N/A

1.3.2.6.10 S-link -> PCI boards $4,284 $4,284 $0 0.15 0 0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*4,284*	*4,284*	*0 days*	*11/14/03*	*2/2/04*	*$4,284*	*$4,284*	*$4,284*	*$0*

Notes

WBS Description: This item covers the cost of purchasing 4 S-link -> PCI boards for the production system.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
S-link -> PCI	Quan	Cost	Total
Boards	4	$1,071.00	$4,284.00

Labor BOE: N/A

1.3.2.6.11 L2 decision processor $8,000 $8,000 $0 0.15 0 0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*8,000*	*8,000*	*0 days*	*3/1/04*	*6/7/04*	*$8,000*	*$8,000*	*$8,000*	*$0*

Notes

WBS Description: This item covers the cost of purchasing two PC's to be used as L2 decision processors.

M&S BOE:

from Run 2a quotes- Pulsar test stand quotes			
L2 decision processor	Quan	Cost	Total

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"L2 decision processor" continued

Notes

PC	2	$4,000.00	$8,000.00

Labor BOE: N/A

1.3.2.7	System Integration standalone w/ test stand	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
13	Physicist	150%	636 hrs	0 days	6/8/04	8/20/04	$0	$0	$0	$0
14	PostDoc	50%	212 hrs	0 days	6/8/04	8/20/04	$0	$0	$0	$0

Notes

WBS Description: This item covers integration of the system, first using the Pulsar teststand to drive the Pulsar L2 system, and after studying/optimizing the performance, testing the L2 decision system using test runs with beam data.

M&S BOE: N/A

Labor BOE: Based on Run 2A experience.

1.3.2.9	Pulsar Level 2 subproject ready for installation	$0	$0	$0	0	0	2

Notes

WBS Description:

Level 2 subproject ready for installation.

1.3.2.10	Pulsar Hardware Ready for Installation	$0	$0	$0	0	0	2
1.3.2.11	Operational Readiness Review	$0	$0	$0	0	0	0
1.3.2.12	L3 MS: Puslar Level 2 subproject ready for installation	$0	$0	$0	0	0	3
1.3.2.13	Firmware development for deployment in B0	$49,896	$0	$49,896	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	60%	907.2 hrs	0 days	1/5/05	9/30/05	$49,896	$49,896	$0	$49,896
32	Pitkanen	100%	1,544 hrs	0 days	1/5/05	9/30/05	$0	$0	$0	$0

Notes

This task is to cover the engineering used for the preparation for operation of the L2 pulsar project.

The ElecEngF fraction is determined to reflex the amount of money paid to Sakuri Pitkanen for the 9 months. ($38,250)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.4	**Event-Builder Upgrade**	**$416,360**	**$274,200**	**$142,160**	**0**	**0**	**0**

Notes

WBS Description:

This summary element covers the Event-Builder upgrade. It includes the complete software development, the construction of a prototype and the construction of the full system.

1.3.4.1	L3 Start Event-Builder Upgrade	$0	$0	$0	0	0	3

Notes

WBS Description:

This milestone marks the beginning date for work on the upgrade of the Event-Builder.

1.3.4.2	technology evaluation	$0	$0	$0	0.3	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
14	*PostDoc*	*40%*	*384 hrs*	*0 days*	*12/5/02*	*5/30/03*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

Before starting to buy a prototype system an evaluation of the present technology will be performed. This evaluation results in the purchase of a prototype which is the most promising technology. The further schedule has been designed to fit the schedule for an upgrade using more powerful successor of the ATM technology. In case a different technology is chosen the schedule should still be appropriate. The price for the ATM technology is almost certainly higher than an alternative technology like Gigabit Ethernet.

M&S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

1.3.4.3	**upgrade software**	**$130,000**	**$130,000**	**$0**	**0**	**0**	**0**

Notes

WBS description:

This summary element covers the software development for the Event-Builder upgrade. It includes an evaluation of the operating system and the associated driver, the work needed for adjusting the drivers and the remaining software.

1.3.4.3.1	decide on the OS versions	$0	$0	$0	0	0.5	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
14	*PostDoc*	*50%*	*40 hrs*	*0 days*	*10/20/03*	*10/31/03*	*$0*	*$0*	*$0*	*$0*

Notes

WBS description:

The decision on the version of the operating system is important since it involves a number of tests. The operation system should be as recent as possible but it has to be well established since errors can be fatal. Drivers are dependent on the version of the operating system and upgrades usually involve extra work.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"decide on the OS versions" continued

Notes

M/S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

1.3.4.3.2	write Control Software	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	2,920 hrs	0 days	11/4/03	4/20/05	$0	$0	$0	$0
14	PostDoc	20%	584 hrs	0 days	11/4/03	4/20/05	$0	$0	$0	$0

Notes

WBS Description:

Write the control software that talks to the Single board computers in VME create and the converter node.
M/S BOE: N/A

Labor BOE:
Based upon experience with the D0 Run 2a system.

1.3.4.3.3	Write Monitoring Software	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	2,920 hrs	0 days	11/4/03	4/20/05	$0	$0	$0	$0
14	PostDoc	20%	584 hrs	0 days	11/4/03	4/20/05	$0	$0	$0	$0

Notes

WBS Description:

Since the ATM network switches are not used in general for the application described here modifications to the drivers are almost certainly necessary. In particular the driver on the VxWorks side needs work to optimize the data throughput.

M/S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

1.3.4.3.5	L3 establish general functionality of software	$0	$0	$0	0	0	3

Notes

WBS Description:

This milestone marks the end of the software development. At this point we intent to freeze the development and move the code to the maintenance phase. During the commissioning further problems might be spotted but the core development is finished at this point. Establishing the general functionality is not necessarily connected to tests with real data. Two more month until the

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"L3 establish general functionality of software" continued

Notes

end of the Event-Builder upgrade leave time for this last test.

1.3.4.3.6	Software commissioning	$130,000	$130,000	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*130,000*	*130,000*	*0 days*	*12/1/04*	*6/29/05*	*$130,000*	*$130,000*	*$13,000*	*$117,000*

Notes

MS BOE:

Two computer professionals from MIT for 145 days.

Mandspass = $109,000 (equivalent base cost for two FNAL computing profesionals)

1.3.4.4	**construct prototype**	**$143,560**	**$54,200**	**$89,360**	**0**	**0**	**0**

Notes

WBS Description:

This summary element covers the construction of a prototype. It includes the purchase of the necessary elements, the installation and evaluation of a test stand.

The cost is based on a quote from a possible vendor in December 2001.

1.3.4.4.1	**purchase prototype system (1/4)**	**$54,200**	**$54,200**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

This summary task covers the purchase of the prototype system. It includes the submission of the PO and the implementation plan, the purchase formalities and the arrival of the hardware.

1.3.4.4.1.1	L3 Submit PO and implementation plan	$0	$0	$0	0	0	3

Notes

WBS Description:

The submission of the purchase order and the implementation plan is a milestone.

1.3.4.4.1.2	purchase formalities for switch	$40,000	$40,000	$0	0.3	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*40,000*	*40,000*	*0 days*	*10/2/03*	*10/24/03*	*$40,000*	*$40,000*	*$40,000*	*$0*

Notes

WBS Description:

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.
For Cisco 6509 switch.
M/S BOE:

FNAL PO 553957 - cost $36,181.14

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"purchase formalities for switch" continued

Notes

Labor BOE: N/A

1.3.4.4.1.3	Purchase formalities for single board computers	$5,200	$5,200	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*5,200*	*5,200*	*0 days*	*10/2/03*	*10/24/03*	*$5,200*	*$5,200*	*$5,200*	*$0*

Notes

WBS Description:
Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.
For 2 VMIC single board computes for VME crates. VMIVME-7805-110
M/S BOE:

Quote to FNAL 21-Aug-03 Quote # C03-5819 price $2600 per SBC - 2 required - $5200

Labor BOE: N/A

1.3.4.4.1.4	Arrival of the prototype Event Builder hardware	$0	$0	$0	0	0	2

Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the test system installation.

1.3.4.4.1.5	EVB Construct prototype schedule contingency	$0	$0	$0	0	0	0

1.3.4.4.1.6	Purchase formalities for Cisco 3750 switch	$9,000	$9,000	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*9,000*	*9,000*	*0 days*	*1/16/04*	*3/12/04*	*$9,000*	*$9,000*	*$9,000*	*$0*

Notes

WBS Description:
Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.
For 1 Cisco Catalyst 3750 Switch and SFP GBIC daughter/transciever cards

M/S BOE:
from e-mail message from Bruce Knuteson 27-Nov-03:

==========
Cisco Catalyst 3750 switch for test system

Cisco part number should be : WS-C3750G-24TS-S

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Purchase formalities for Cisco 3750 switch" continued

Notes

The switch is a 24-port 10/100/1000 copper ports, and 4 SFP Gigabit ports.
List Price is $7000

You will need to order the SFP GBIC daughter/transceiver cards Cisco part number: GLC-SX-MM, GE SFP, LC connector SX transceiver List Price is $500Each
==========

Labor BOE: N/A

1.3.4.4.2	install test stand	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	512 hrs	0 days	10/27/03	2/2/04	$0	$0	$0	$0
14	PostDoc	20%	102.4 hrs	0 days	10/27/03	2/2/04	$0	$0	$0	$0

Notes

WBS Description:

The installation of the goes quick since the environment is prepared.

M/S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

1.3.4.4.3	evaluate test stand	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	512 hrs	0 days	2/3/04	4/30/04	$0	$0	$0	$0
14	PostDoc	20%	102.4 hrs	0 days	2/3/04	4/30/04	$0	$0	$0	$0

Notes

WBS Description:

The evaluation of the test stand is meant to establish the technical functionality of the hardware. Potential problems might require change of equipment.

M/S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.4.4.4	L3 establish functionality of hardware	$0	$0	$0	0	0	3

Notes

WBS Description:

Establishing the hardware functionality of the test system is a milestone and marks the point when the complete system should be purchased.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.4.4.6	Engineering for Prototype system	$42,240	$0	$42,240	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	24%	768 hrs	0 days	10/2/03	5/6/05	$42,240	$38,927	$34,214	$8,026

Notes

WBS Description:

The engineering effort by Ron Rechenmacher of FNAL on Prototype Event Builder system

M&S BOE: N/A

Labor BOE:

Estimation based on similar work done with D0 collaboration on their existing system

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.4.4.7	Network Stetup for Prototype system	$7,520	$0	$7,520	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
3	CompProfF	100%	160 hrs	0 days	2/3/04	3/1/04	$7,520	$7,520	$7,520	$0

Notes

WBS Description:

The effort by FNAL Computing Division Network group on setting up the network switch for the Prototype Event Builder system

M&S BOE: N/A

Labor BOE:

Estimation based on similar work done through out the lab

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.4.4.8	Engineering for TDC readout	$39,600	$0	$39,600	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	50%	720 hrs	0 days	9/1/04	5/20/05	$39,600	$39,600	$0	$39,600

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.4.5	**construct full size system**	**$132,800**	**$80,000**	**$52,800**	**0**	**0**	**0**

Notes

WBS Description:

This summary element covers the construction of the full size Event-Builder system. It includes a readiness review, the purchase, installation and evaluation of the hardware and finally the completion of the system.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"construct full size system" continued

Notes

M&S BOE:

The cost is based on a quote by a possible vendor from December 2001.

1.3.4.5.1	Production Readiness Review - Event Builder	$0	$0	$0	0	0	0

Notes

WBS Description:

Production readiness review for the Event Builder. Successful outcome from the review means that we will proceed to the production phase of the project.

M&S BOE: N/A

Labor BOE: N/A

Schedule BOE: lag of 100 days due to anticipated funding for FY2004

1.3.4.5.3	Event Builder Production Readiness Review	$0	$0	$0	0	0	2

Notes

WBS Description:

After the system has been proven to work as a prototype a readiness review formally approves the purchase of the full size system.

1.3.4.5.4	**purchase remaining hardware**	**$80,000**	**$80,000**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

This summery task covers the purchase of the remaining hardware to construct the full size system. It includes the submission of the purchase order and implementation plan, purchase formality and ends with the arrival of the hardware.

1.3.4.5.4.1	L3 submit PO and implementation plan	$0	$0	$0	0	0	3

Notes

WBS Description:

The submission of the purchase order and the implementation plan is a milestone.

1.3.4.5.4.2	purchase formalities	$80,000	$80,000	$0	0.3	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*80,000*	*80,000*	*0 days*	*6/23/04*	*8/30/04*	*$80,000*	*$80,000*	*$80,000*	*$0*

Notes

WBS Description:

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.
These include the purchase of 24 single board computers and

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"purchase formalities" continued

Notes

2 48 port Cisco WS-X6748-GE-TX Gigabit Ethernet over copper modules.
M/S BOE:
Vendor quote August 21,2003 24 Single board computers - $2457.90/each = $58,989.60
Cisco WS-X6748-GE-TX module price comes from PO 553957 - $10,000/each = $20,000

Labor BOE: N/A

1.3.4.5.4.4	Arrival of the Event Builder hardware	$0	$0	$0	0	0	2

Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the production system installation.

1.3.4.5.4.6	Contingency on arrival of event builder hardware	$0	$0	$0	0	0	0
1.3.4.5.5	assemble new hardware in B0 third floor	$8,800	$0	$8,800	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	*ElecEngF*	*100%*	*160 hrs*	*0 days*	*11/29/04*	*12/28/04*	*$8,800*	*$8,800*	*$8,800*	*$0*
8	*StudentU*	*100%*	*160 hrs*	*0 days*	*11/29/04*	*12/28/04*	*$0*	*$0*	*$0*	*$0*
14	*PostDoc*	*20%*	*32 hrs*	*0 days*	*11/29/04*	*12/28/04*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

The assembly of the new hardware should go smoothly since the room is well prepared.

M/S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

1.3.4.5.6	evaluate the Full System	$17,600	$0	$17,600	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	*ElecEngF*	*100%*	*320 hrs*	*0 days*	*12/29/04*	*2/25/05*	*$17,600*	*$17,600*	*$880*	*$16,720*
8	*StudentU*	*100%*	*320 hrs*	*0 days*	*12/29/04*	*2/25/05*	*$0*	*$0*	*$0*	*$0*
14	*PostDoc*	*20%*	*64 hrs*	*0 days*	*12/29/04*	*2/25/05*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

The evaluation of the new hardware might reveal problems in some of the components and we leave some time in case hardware needs to be exchanged by the vendor. The new software is being tested as well.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"evaluate the Full System" continued

Notes

M/S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

1.3.4.5.7	L3 establish functionality of hardware	$0	$0	$0	0	0	3

Notes

WBS Description:

Establishing the hardware functionality of the test system is a milestone and marks the point when the complete system should be purchased.

1.3.4.5.9	Engineering support for full sized system	$26,400	$0	$26,400	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	50%	480 hrs	0 days	9/1/04	2/25/05	$26,400	$26,400	$5,280	$21,120

1.3.4.6	Switch Data taking to new Event Builder	$0	$0	$0	0.3	0.5	0

Notes

WBS Description:

Hardware and software commissioning involves data taking since only then the last problems can be found and corrected. Experience from Run IIa show that 2 month is a reasonable time to fix the most important problems.

M/S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

1.3.4.7	L3 Finish Event Builder Upgrade	$0	$0	$0	0	0	3
1.3.4.8	Finish Event-Builder Upgrade	$0	$0	$0	0	0	2

Notes

WBS Description:

This milestone marks the end of the Event-Builder upgrade. This means that the hardware is in place and has been proven to technically work, the software development has been finished and its functionality has been proven with real data.

1.3.4.10	Procure support hardware and software	$10,000	$10,000	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	10,000	10,000	0 days	10/2/03	3/11/05	$10,000	$10,000	$8,694	$1,306

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
"Procure support hardware and software" continued							

Notes
These funds are to cover miscellaneous expenses.

1.3.5	**Computer for Level3 PC Farm / DAQ**	**$382,500**	**$382,500**	**$0**	**0**	**0**	**0**

Notes
WBS Description:

This summary task covers the computer purchases for the general DAQ system and the Level-3 PC Farm. The purchases are staged since they are replacing PCs which become obsolete. Prices are based on a recent purchase of similar hardware.

1.3.5.1	Start Computers for Level3 PC Farm/DAQ	$0	$0	$0	0	0	3

Notes
WBS Description:

This milestone marks the beginning of the DAQ and Level3 computer purchases.

1.3.5.3	**replace 15 DAQ PCs (2004)**	**$37,500**	**$37,500**	**$0**	**0**	**0**	**0**

Notes
WBS Description:

Summary task describing the purchase of 15 DAQ computers in FY004.

1.3.5.3.1	submit PO and implementation plan	$0	$0	$0	0	0	3

Notes
WBS Description:

The submission of the purchase order and the implementation plan is a milestone.

1.3.5.3.2	purchase formalities	$37,500	$37,500	$0	0.3	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*37,500*	*37,500*	*0 days*	*10/14/04*	*4/13/05*	*$37,500*	*$37,500*	*$22,500*	*$15,000*

Notes
WBS Description:

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.

M&S BOE:

M&S cost increased due to $15,000 transfer from WBS 1.3.5.2.2

Recent PO for similar purchase in run 2a.

Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"purchase formalities" continued

Notes

Schedule BOE: lag of 230 days due to anticipated funding for FY2004

1.3.5.3.3	install and test one prototype machine	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	80 hrs	0 days	12/13/04	12/28/04	$0	$0	$0	$0
14	PostDoc	20%	16 hrs	0 days	12/13/04	12/28/04	$0	$0	$0	$0

Notes

WBS Description:

To insure that the machines perform to the specifications and to download the appropriate software they are installed and tested at Fermilab. The prototype is sent back to the vendor for cloning.

M&S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

1.3.5.3.4	L3MS: arrival of 15 DAQ PCs from the vendor	$0	$0	$0	0	0	3

Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the test system installation.

1.3.5.3.5	burn in phase	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	50%	40 hrs	0 days	1/7/05	1/21/05	$0	$0	$0	$0

Notes

WBS Description:

In the burn in phase the PCs are running under load to find potential problems. The vendor is responsible to replace failing hardware in due time.

M&S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.5.3.6	installation into the DAQ system	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	40 hrs	0 days	1/24/05	1/28/05	$0	$0	$0	$0
14	PostDoc	20%	8 hrs	0 days	1/24/05	1/28/05	$0	$0	$0	$0

Notes
WBS Description:

The installation of the nodes into their final location should be rather smooth since the environment will be well prepared.

M&S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

1.3.5.3.7	Arrival of 15 PCs from the vendor	$0	$0	$0	0	0	2

Notes
WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the test system installation.

1.3.5.3.8	Replace 15 DAQ PCs schedule contingency	$0	$0	$0	0	0	0
1.3.5.4	**replace 20 DAQ PCs (2005)**	**$30,000**	**$30,000**	**$0**	**0**	**0**	**0**

Notes
WBS Description:

Summary task describing the purchase of 20 DAQ computers in FY2005.

1.3.5.4.1	submit PO and implementation plan	$0	$0	$0	0	0	3

Notes
WBS Description:

The submission of the purchase order and the implementation plan is a milestone.

1.3.5.4.2	purchase formalities	$30,000	$30,000	$0	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	30,000	30,000	0 days	5/6/05	8/1/05	$30,000	$30,000	$0	$30,000

Notes
WBS Description:

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"purchase formalities" continued

Notes

M&S BOE:

Based on recent PO from similar run 2a purchase

Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.5.4.3	install and test one prototype machine	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	80 hrs	0 days	8/2/05	8/15/05	$0	$0	$0	$0
14	PostDoc	20%	16 hrs	0 days	8/2/05	8/15/05	$0	$0	$0	$0

Notes

WBS Description:

To insure that the machines perform to the specifications and to download the appropriate software they are installed and tested at Fermilab. The prototype is sent back to the vendor for cloning.

M&S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.5.4.4	arrival of 20 DAQ PCs from the vendor	$0	$0	$0	0	0	3

Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the test system installation.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.5.4.5	burn in phase	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	50%	40 hrs	0 days	8/16/05	8/29/05	$0	$0	$0	$0

Notes

WBS Description:

In the burn in phase the PCs are running under load to find potential problems. The vendor is responsible to replace failing hardware in due time.

M&S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"burn in phase" continued

Notes

1.3.5.4.6	installation into the DAQ system	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	40 hrs	0 days	8/30/05	9/6/05	$0	$0	$0	$0
14	PostDoc	20%	8 hrs	0 days	8/30/05	9/6/05	$0	$0	$0	$0

Notes

WBS Description:

The installation of the nodes into their final location should be rather smooth since the environment will be well prepared.

M&S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

1.3.5.4.8	Replace 20 DAQ PCs schedule contingency	$0	$0	$0	0	0	0
1.3.5.5	**replace 70 Level 3 PCs (2004)**	**$105,000**	**$105,000**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

Summary task describing the purchase of 70 level 3 computers in FY2004.

1.3.5.5.1	submit PO and implementation plan	$0	$0	$0	0	0	3

Notes

WBS Description:

The submission of the purchase order and the implementation plan is a milestone.

1.3.5.5.2	purchase formalities	$105,000	$105,000	$0	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	105,000	105,000	0 days	8/25/04	9/22/04	$105,000	$105,000	$105,000	$0

Notes

WBS Description:

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.

M&S BOE:

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"purchase formalities" continued

Notes

Recent PO for similar purchase in run 2a.

Labor BOE: N/A

Schedule BOE: lag of 230 days due to anticipated funding for FY2004

1.3.5.5.3	install and test one prototype machine	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	80 hrs	0 days	9/23/04	10/6/04	$0	$0	$0	$0
14	PostDoc	20%	16 hrs	0 days	9/23/04	10/6/04	$0	$0	$0	$0

Notes

WBS Description:

To insure that the machines perform to the specifications and to download the appropriate software they are installed and tested at Fermilab. The prototype is sent back to the vendor for cloning.

M&S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

1.3.5.5.5	Arrival of 70 Level3 and 15 DAQ PCs from the vendor	$0	$0	$0	0	0	2

Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the installation of 70 Level 3 worker node PC's and 15 DAQ PC's.

1.3.5.5.6	burn in phase	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	50%	100 hrs	0 days	11/4/04	12/10/04	$0	$0	$0	$0

Notes

WBS Description:

In the burn in phase the PCs are running under load to find potential problems. The vendor is responsible to replace failing hardware in due time.

M&S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.5.5.7	installation into the DAQ system	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	40 hrs	0 days	12/13/04	12/17/04	$0	$0	$0	$0
14	PostDoc	20%	8 hrs	0 days	12/13/04	12/17/04	$0	$0	$0	$0

Notes

WBS Description:

The installation of the nodes into their final location should be rather smooth since the environment will be well prepared.

M&S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.5.6	**replace 140 Level 3 PCs (2005)**	**$210,000**	**$210,000**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

Summary task describing the purchase of 140 level 3 computers in FY2005.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.5.6.1	submit PO and implementation plan	$0	$0	$0	0	0	3

Notes

WBS Description:

The submission of the purchase order and the implementation plan is a milestone.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.5.6.2	purchase formalities	$210,000	$210,000	$0	0.3	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	210,000	210,000	0 days	5/6/05	8/1/05	$210,000	$210,000	$0	$210,000

Notes

WBS Description:

Purchase formalities take a rather long time at Fermilab, therefore they are included in the WBS.

M&S BOE:

Based on recent PO from similar run 2a purchase

Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.5.6.3	install and test one prototype machine	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	80 hrs	0 days	8/2/05	8/15/05	$0	$0	$0	$0
14	PostDoc	20%	16 hrs	0 days	8/2/05	8/15/05	$0	$0	$0	$0

Notes

WBS Description:

To insure that the machines perform to the specifications and to download the appropriate software they are installed and tested at Fermilab. The prototype is sent back to the vendor for cloning.

M&S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.5.6.5	Arrival of 140/20 PCs from the vendor	$0	$0	$0	0	0	2

Notes

WBS Description:

The arrival of the hardware is a milestone which marks the beginning of the installation of 140 Level 3 PCs and 20 DAQ PC's.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.5.6.6	burn in phase	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	50%	40 hrs	0 days	8/16/05	8/29/05	$0	$0	$0	$0

Notes

WBS Description:

In the burn in phase the PCs are running under load to find potential problems. The vendor is responsible to replace failing hardware in due time.

M&S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.5.6.7	installation into the DAQ system	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	100%	40 hrs	0 days	8/30/05	9/6/05	$0	$0	$0	$0
14	PostDoc	20%	8 hrs	0 days	8/30/05	9/6/05	$0	$0	$0	$0

Notes

WBS Description:

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"installation into the DAQ system" continued

Notes

The installation of the nodes into their final location should be rather smooth since the environment will be well prepared.

M&S BOE: N/A

Labor BOE:
Based upon experience with the Run 2a system.

1.3.5.8	Finish Purchase of Computers for Level3/DAQ system	$0	$0	$0	0	0	2

Notes
WBS Description:

This milestone marks the end of the PC purchases for the DAQ and the Level3 PC Farm.

1.3.6	**SVT upgrade**	**$267,520**	**$186,120**	**$81,400**	**0**	**0**	**0**

Notes
WBS Description:

CDF Silicon Vertex Tracker Run 2b upgrade. Upgrade necessary due to differences between SVX IIa and SVX IIb detector geometry. System operation identical to the Run 2a SVT.

1.3.6.1	**Design and Simulation**	**$81,400**	**$0**	**$81,400**	**0**	**0**	**0**
1.3.6.1.1	**AMS and Road Warrior**	**$0**	**$0**	**$0**	**0**	**0**	**0**
1.3.6.1.1.1	Design Phase	$0	$0	$0	0	0	0

Notes
Duration estimate from A. Cerri's review talk (29 June)

1.3.6.1.1.2	Board simulation	$0	$0	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
7	*PostDocU*	*10%*	*64 hrs*	*0 days*	*8/30/04*	*12/22/04*	*$0*	*$0*	*$0*	*$0*

Notes
Duration estimate from A. Cerri's review talk (29 June)

1.3.6.1.1.3	Firmware	$0	$0	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
7	*PostDocU*	*50%*	*480 hrs*	*0 days*	*8/9/04*	*2/2/05*	*$0*	*$0*	*$0*	*$0*

Notes
Duration estimate from A. Cerri's review talk (29 June)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.6.1.1.4	L3 AMS Firmware Complete	$0	$0	$0	0	0	3
1.3.6.1.1.5	AMS Firmware Complete	$0	$0	$0	0	0	2
1.3.6.1.1.6	L3 Begin AMS Design Work	$0	$0	$0	0	0	3
1.3.6.1.1.7	Begin AMS Design Work	$0	$0	$0	0	0	2
1.3.6.1.2	**Hit Buffer**	**$81,400**	**$0**	**$81,400**	**0**	**0**	**0**
1.3.6.1.2.1	Design Phase	$0	$0	$0	0	0	0

Notes
Duration estimate from A. Cerri's review talk (29 June)

1.3.6.1.2.2	Board simulation	$0	$0	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
7	*PostDocU*	*10%*	*80 hrs*	*0 days*	*9/1/04*	*1/28/05*	*$0*	*$0*	*$0*	*$0*

Notes
Duration estimate from A. Cerri's review talk (29 June)

1.3.6.1.2.3	Firmware	$81,400	$0	$81,400	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
4	*ElecEngF*	*100%*	*1,480 hrs*	*0 days*	*1/7/05*	*9/28/05*	*$81,400*	*$52,800*	*$0*	*$81,400*
7	*PostDocU*	*10%*	*148 hrs*	*0 days*	*1/7/05*	*9/28/05*	*$0*	*$0*	*$0*	*$0*

Notes
Duration estimate from A. Cerri's review talk (29 June)

1.3.6.1.2.4	L3 Hit Buffer Firmware Complete	$0	$0	$0	0	0	3
1.3.6.1.2.5	Hit Buffer Firmware Complete	$0	$0	$0	0	0	2
1.3.6.1.3	**Track Fitter**	**$0**	**$0**	**$0**	**0**	**0**	**0**
1.3.6.1.3.1	Design Phase	$0	$0	$0	0	0	0

Notes
Duration estimate from A. Cerri's review talk (29 June)

1.3.6.1.3.2	Board simulation	$0	$0	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
7	*PostDocU*	*10%*	*72 hrs*	*0 days*	*8/30/04*	*1/11/05*	*$0*	*$0*	*$0*	*$0*

Notes
Duration estimate from A. Cerri's review talk (29 June)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.6.1.3.3	Firmware	$0	$0	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	25%	280 hrs	0 days	8/9/04	3/2/05	$0	$0	$0	$0
8	StudentU	50%	560 hrs	0 days	8/9/04	3/2/05	$0	$0	$0	$0

Notes
Duration estimate from A. Cerri's review talk (29 June)

1.3.6.1.3.4	L3 Track Fitter Firmware Complete	$0	$0	$0	0	0	3
1.3.6.1.3.5	Track Fitter Firmware Complete	$0	$0	$0	0	0	2
1.3.6.1.3.6	L3 Begin Track Fitter Design	$0	$0	$0	0	0	3
1.3.6.1.3.7	Begin Track Fitter Design	$0	$0	$0	0	0	2
1.3.6.1.4	**Associative Memory ++**	**$0**	**$0**	**$0**	**0**	**0**	**0**
1.3.6.1.4.1	Design Phase	$0	$0	$0	0	0	0

Notes
Duration estimate from A. Cerri's review talk (29 June)

1.3.6.1.4.2	Board simulation	$0	$0	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	10%	60 hrs	0 days	9/30/04	1/21/05	$0	$0	$0	$0

Notes
Duration estimate from A. Cerri's review talk (29 June)

1.3.6.1.4.3	Firmware	$0	$0	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	100%	160 hrs	0 days	12/29/04	1/28/05	$0	$0	$0	$0

Notes
Duration estimate from A. Cerri's review talk (29 June)

1.3.6.2	**Hardware Construction**	**$186,120**	**$186,120**	**$0**	**0**	**0**	**0**
1.3.6.2.1	**AMS and Road Warrior**	**$33,360**	**$33,360**	**$0**	**0**	**0**	**0**
1.3.6.2.1.1	**Mezzanine Cards (RAM 1)**	**$33,360**	**$33,360**	**$0**	**0**	**0**	**0**

Notes
RAM 1 is 4 M x 48 bit memory

RAM 2 is 512K x 24 bit memory

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Mezzanine Cards (RAM 1)" continued

Notes

Hit buffer uses 1 RAM 1 + 1 RAM 2 cards

AMS uses 1 RAM 1 + 1 RAM 2 cards

Track Fitter uses 2 RAM 1 + 2 RAM 2 cards

This means we need 48 of each plus 12 spares.

1.3.6.2.1.1.1	Design	$17,600	$17,600	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	17,600	17,600	23 days	10/5/04	11/10/04	$17,600	$0	$17,600	$0
17	ENG UNIV	100%	400 hrs	0 days	9/1/04	11/10/04	$0	$0	$0	$0
34	Tang	100%	400 hrs	0 days	9/1/04	11/10/04	$0	$0	$0	$0

Notes

Based on 100% of Tang's time for 6 weeks. In-Kind contribution from UC.

1.3.6.2.1.1.2	Production	$14,000	$14,000	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	14,000	14,000	0 days	11/11/04	5/20/05	$14,000	$2,800	$3,500	$10,500

Notes

M&S estimate: From Mel Shochet's review talk (29 June) - 14 boards * $200 each

1.3.6.2.1.1.3	Testing	$1,760	$1,760	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,760	1,760	0 days	12/13/04	1/28/05	$1,760	$0	$704	$1,056
17	ENG UNIV	10%	24 hrs	0 days	12/13/04	1/28/05	$0	$0	$0	$0
34	Tang	10%	24 hrs	0 days	12/13/04	1/28/05	$0	$0	$0	$0

Notes

Based on 10% of Tang's time for 12 weeks. In-Kind contribution from UC.

1.3.6.2.1.1.4	L3 Begin AMS Mezzanine Card Production	$0	$0	$0	0	0	3
1.3.6.2.1.1.5	Begin AMS Mezzanine Card Production	$0	$0	$0	0	0	2
1.3.6.2.2	**Hit Buffer**	**$95,360**	**$95,360**	**$0**	**0**	**0**	**0**

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.6.2.2.1	**Mezzanine Cards (RAM 2)**	**$33,360**	**$33,360**	**$0**	**0**	**0**	**0**

Notes

RAM 1 is 4 M x 48 bit memory

RAM 2 is 512K x 24 bit memory

Hit buffer uses 1 RAM 1 + 1 RAM 2 cards

AMS uses 1 RAM 1 + 1 RAM 2 cards

Track Fitter uses 2 RAM 1 + 2 RAM 2 cards

This means we need 48 of each plus 12 spares.

1.3.6.2.2.1.1	Design	$17,600	$17,600	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*17,600*	*17,600*	*0 days*	*12/13/04*	*2/4/05*	*$17,600*	*$0*	*$0*	*$17,600*
17	*ENG UNIV*	*100%*	*280 hrs*	*0 days*	*12/13/04*	*2/4/05*	*$0*	*$0*	*$0*	*$0*
34	*Tang*	*100%*	*280 hrs*	*0 days*	*12/13/04*	*2/4/05*	*$0*	*$0*	*$0*	*$0*

Notes

Based on 100% of Tang's time for 6 weeks. In-Kind contribution from UC.

1.3.6.2.2.1.2	Production	$14,000	$14,000	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
10	*MANDSPASS*	*14,000*	*14,000*	*0 days*	*2/7/05*	*4/29/05*	*$14,000*	*$4,200*	*$0*	*$14,000*

Notes

M&S estimate: From Mel Shochet's review talk (29 June) - 14 boards * $100 each +
M&S estimate: From Mel Shochet's review talk (29 June) - 14 boards * $200 each

1.3.6.2.2.1.3	Testing	$1,760	$1,760	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*1,760*	*1,760*	*0 days*	*3/7/05*	*4/15/05*	*$1,760*	*$0*	*$0*	*$1,760*
17	*ENG UNIV*	*10%*	*24 hrs*	*0 days*	*3/7/05*	*4/15/05*	*$0*	*$0*	*$0*	*$0*
34	*Tang*	*10%*	*24 hrs*	*0 days*	*3/7/05*	*4/15/05*	*$0*	*$0*	*$0*	*$0*

Notes

Based on 10% of Tang's time for 12 weeks. In-Kind contribution from UC.

1.3.6.2.2.2	**Transition Cards**	**$4,600**	**$4,600**	**$0**	**0**	**0**	**0**

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.6.2.2.1	Design	$220	$220	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	220	220	0 days	3/7/05	3/11/05	$220	$0	$0	$220
17	ENG UNIV	50%	20 hrs	0 days	3/7/05	3/11/05	$0	$0	$0	$0
34	Tang	50%	20 hrs	0 days	3/7/05	3/11/05	$0	$0	$0	$0

Notes

Based on 50% of Tang's time for 1 week. In-Kind contribution from UC.

1.3.6.2.2.2	Production	$3,500	$3,500	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	3,500	3,500	0 days	3/14/05	4/8/05	$3,500	$3,500	$0	$3,500

Notes

M&S estimate: From Mel Shochet's review talk (29 June) - 14 boards * $250 each

1.3.6.2.2.3	Testing	$880	$880	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	880	880	0 days	4/11/05	5/6/05	$880	$0	$0	$880
17	ENG UNIV	10%	16 hrs	0 days	4/11/05	5/6/05	$0	$0	$0	$0
34	Tang	10%	16 hrs	0 days	4/11/05	5/6/05	$0	$0	$0	$0

Notes

Based on 10% of Tang's time for 1 month. In-Kind contribution from UC.

1.3.6.2.2.3	Pulsar Boards	$57,400	$57,400	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	57,400	57,400	0 days	1/31/05	6/6/05	$57,400	$57,400	$0	$57,400

Notes

M&S BOE:

We need 12 boards (plus 2 spares) for a total of 14 boards at $4,100 each in FY04 dollars. See item 1.3.11.8.5.

1.3.6.2.2.4	Test Hit Buffer System	$0	$0	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	100%	320 hrs	0 days	7/6/05	8/30/05	$0	$0	$0	$0

1.3.6.2.3	**Track Fitter**	**$57,400**	**$57,400**	**$0**	**0**	**0**	**0**
1.3.6.2.3.1	**Mezzanine Cards (RAM 2)**	**$0**	**$0**	**$0**	**0**	**0**	**0**

Notes

RAM 1 is 4 M x 48 bit memory

RAM 2 is 512K x 24 bit memory

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Mezzanine Cards (RAM 2)" continued

Notes

Hit buffer uses 1 RAM 1 + 1 RAM 2 cards

AMS uses 1 RAM 1 + 1 RAM 2 cards

Track Fitter uses 2 RAM 1 + 2 RAM 2 cards

This means we need 48 of each plus 12 spares.

All resources and schedule have been moved to 1.3.6.2.2.1

1.3.6.2.3.1.1	Design	$0	$0	$0	0	0	0

Notes

Same as 1.3.6.2.2.1.1

1.3.6.2.3.1.2	Production	$0	$0	$0	0	0	0

Notes

M&S estimate: From Mel Shochet's review talk (29 June) - 28 boards * $750 each

Same as 1.3.6.2.2.1.2

1.3.6.2.3.1.3	Testing	$0	$0	$0	0	0	0

Notes

Same as 1.3.6.2.2.1.3

1.3.6.2.3.2	Pulsar Boards	$57,400	$57,400	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
10	*MANDSPASS*	*57,400*	*57,400*	*0 days*	*1/31/05*	*6/6/05*	*$57,400*	*$57,400*	*$0*	*$57,400*

Notes

M&S BOE:

We need 12 boards (plus 2 spares) for a total of 14 boards at $4,100 each in FY04 dollars. See item 1.3.11.8.5.

1.3.6.2.5	Test of AMS and Road Warrior	$0	$0	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
6	*PhysicistU*	*100%*	*160 hrs*	*0 days*	*4/18/05*	*5/13/05*	*$0*	*$0*	*$0*	*$0*

1.3.6.2.6	**Associative Memory ++**	**$0**	**$0**	**$0**	**0**	**0**	**0**
1.3.6.2.6.1	Test prototype Amchip, Lamb, Amboard	$0	$0	$0	0	0	0
1.3.6.2.6.2	Production of Amchip, Lamb, Amboard	$0	$0	$0	0	0	0

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
"Production of Amchip, Lamb, Amboard" continued							
1.3.6.2.6.3	L3 Begin Ampchip Production	$0	$0	$0	0	0	3
1.3.6.2.6.4	Begin Ampchip Production	$0	$0	$0	0	0	2
1.3.6.2.7	Test Track Fitter	$0	$0	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
6	*PhysicistU*	*100%*	*160 hrs*	*0 days*	*6/7/05*	*7/5/05*	*$0*	*$0*	*$0*	*$0*

1.3.6.3 SVT ready for installation	$0	$0	$0	0	0	2

Notes
WBS Description:

Milestone denoting the completion of the SVT.

1.3.6.4 L3 SVT ready for installation	$0	$0	$0	0	0	3
1.3.8 Finish Run 2b Trigger DAQ project	$0	$0	$0	0	0	2

Notes
WBS Description:

Milestone marking the end of the CDF Run 2b Trigger/DAQ upgrade subproject.

1.3.9 Data Acquisition and Trigger Upgrades Ready To Install	$0	$0	$0	0	0	2

Notes
WBS Description:

Milestone marking the end of the CDF Run 2b Trigger/DAQ upgrade subproject. This milestone is coupled to the corresponding level 2 milestone with added schedule contingency.

1.3.10	**Accelerator "Summer" Shutdown planning tasks**	**$0**	**$0**	**$0**	**0**	**0**	**0**
1.3.10.1	Accelerator Shutdown 2004	$0	$0	$0	0	0	0

Notes
WBS Description:

Planning task to Cover 3 month accelerator shutdown in 2004.

1.3.10.2	Accelerator Shutdown 2005	$0	$0	$0	0	0	0

Notes
WBS Description:

Planning task to Cover 3 month accelerator shutdown in 2004.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.10.3	L3 MS: 2004 Shutdown Complete	$0	$0	$0	0	0	3
1.3.11	**Revised XFTII Project**	**$1,341,050**	**$1,150,393**	**$190,657**	**0**	**0**	**0**

Notes
WBS Description:

Project to Upgrade the CDF Level 1 tracking trigger system.

1.3.11.1	L3 Start of Revised XFTII Project	$0	$0	$0	0	0	3

Notes
WBS Description:

Milestone - marking the start of the XFTII upgrade project.

1.3.11.2	**Finder Boards**	**$660,479**	**$488,600**	**$171,879**	**0**	**0**	**0**

Notes
WBS Description:

Development of axial and stereo segment Finder boards. These boards take hit information from the COT and find track segments in the COT superlayers.

1.3.11.2.1	Finder system specification	$5,720	$0	$5,720	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
4	*ElecEngF*	*20%*	*104 hrs*	*0 days*	*6/1/04*	*8/31/04*	*$5,720*	*$5,720*	*$5,720*	*$0*
23	*Shaw*	*20%*	*26 hrs*	*49.75 days*	*8/10/04*	*9/1/04*	*$0*	*$0*	*$0*	*$0*

Notes
WBS Description:

Finder System Specification: This task will include design specification and draft report on the Finder board implementation.

M&S BOE: N/A

Labor BOE: 50% FNAL Engineer (T. Shaw) for 4.2 weeks

1.3.11.2.2	Finder Board FPGA Firmware development (FNAL)	$45,760	$0	$45,760	0	0.5	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
4	*ElecEngF*	*40%*	*832 hrs*	*0 days*	*6/15/04*	*6/27/05*	*$45,760*	*$45,760*	*$24,464*	*$21,296*
24	*Holm*	*40%*	*748.8 hrs*	*26 days*	*7/22/04*	*6/27/05*	*$0*	*$0*	*$0*	*$0*

Notes
WBS Description:

Finder Board FPGA Firmware development (FNAL). This work will include development of Finder chip firmware, VMEbus slave interface and various control algorithms.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Finder Board FPGA Firmware development (FNAL)" continued

Notes

M&S BOE: N/A

Labor BOE: Resource: 40% FNAL Engineer (S. Holm)

1.3.11.2.3 Finder Board FPGA Firmware development (OSU) $0 $0 $0 0 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	416 hrs	0 days	6/15/04	6/27/05	$0	$0	$0	$0

Notes

WBS Description:

Finder Board FPGA Firmware development (OSU). This work includes development of Finder chip firmware. Specifically the development of the portion that contains the finder masks.

M&S BOE: N/A

Labor BOE: Resource: 20% Ohio State Postdoc (B. Kilminster)

1.3.11.2.4 Preproduction Finder boards (FNAL) $138,075 $48,600 $89,475 0 0 0

Notes

WBS Description:

Summary task for development of prototype finder boards.

1.3.11.2.4.1 Finder Board Schematic Design $13,200 $0 $13,200 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	50%	240 hrs	0 days	6/29/04	9/22/04	$13,200	$13,200	$13,200	$0
23	Shaw	50%	180 hrs	15 days	7/21/04	9/23/04	$0	$0	$0	$0

Notes

WBS Description:

Finder Board Schematic Design: This task will involve the completion of the Finder schematic and the design of the board control logic.

M&S BOE: N/A

Labor BOE: Resource: 50% FNAL Engineer (T. Shaw) for 12 weeks

1.3.11.2.4.2 Finder Board layout $15,295 $0 $15,295 0.5 0.5 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	10%	76 hrs	0 days	7/21/04	12/3/04	$4,180	$2,640	$4,180	$0

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Finder Board layout" continued

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
5	ElecTechF	38%	285 hrs	0 days	7/21/04	12/3/04	$11,115	$7,020	$11,115	$0
23	Shaw	10%	66.4 hrs	12 days	8/6/04	12/3/04	$0	$0	$0	$0
25	Wesson	38%	252.32 hrs	12 days	8/6/04	12/3/04	$0	$0	$0	$0

Notes

WBS Description:

Finder Board layout: This task will involve the design engineer working closely with a PCB layout professional.

M&S BOE: N/A

Labor BOE: 75% FNAL Sr. Tech (T. Wesson) for 6 weeks
20% FNAL Engineer (T. Shaw) for 6 weeks

1.3.11.2.4.3 L3 Fabrication of Preproduction XFT Finder board $0 $0 $0 0 0 3

Notes

WBS Description:

This milestone denotes the fabrication of the first prototype Finder 1/3 board.

1.3.11.2.4.4 Purchase Preproduction Finder Board components $48,600 $48,600 $0 0 0 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
9	MANDS	48,600	48,600	0 days	8/11/04	11/17/04	$48,600	$48,600	$48,600	$0

Notes

WBS Description:

Purchase Preproduction Finder Board Components: This task will cover the costs of procuring the PCBs and components for four Preproduction Finder modules.

M&S BOE: $48,600 (4 prototypes @$12,150) **This translates to $46,215 in FY02 dollars.**

Component Cost per module:
PCB @ $1500
6 dual O/E parts @ $150 = $900
2 dual E/O parts @ $150 = $300
9 Finder FPGAs @ $800 = $7,200 (Altera EP1S25 is ~$865)
1 FPGA general board Control = $250
Misc. logic and FRAM = $500
5 Mezzanine modules @$300 = $1,500 (possibly put SERDES parts on mezzanine boards)
Board Total = $12,150

Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.2.4.5	Prepare bid package	$2,420	$0	$2,420	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	25%	44 hrs	0 days	10/28/04	11/30/04	$2,420	$3,300	$2,420	$0
23	Shaw	25%	44 hrs	0 days	10/28/04	11/30/04	$0	$0	$0	$0

Notes

WBS Description:

Prepare bid package: This tasks refers to work which is done to describe and specify the manufacture of the PCB and the board assembly.

M&S BOE: N/A

Labor BOE: 25% FNAL Engineer (T. Shaw) for 4 weeks

1.3.11.2.4.6	Fabricate Preproduction Finder board	$0	$0	$0	0.3	0	0

Notes

WBS Description:

Period of time allocated for manufacturing the boards.

M&S BOE: N/A

Labor BOE: N/A

1.3.11.2.4.7	Assembly Preproduction Finder Board	$0	$0	$0	0	0	0

Notes

WBS Description:

Period of time allocated for module assembly.

M&S BOE: N/A

Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.2.4.8	Test Stand Setup	$1,716	$0	$1,716	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
5	ElecTechF	10%	44 hrs	0 days	10/21/04	1/13/05	$1,716	$1,716	$608	$1,108
26	Scott	10%	44 hrs	0 days	10/21/04	1/13/05	$0	$0	$0	$0

Notes

WBS Description:

This task involves the physical set-up of the test stand.

M&S BOE: N/A

Labor BOE: 25% FNAL Sr. Tech (L. Scott) for 4 weeks

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.2.4.9	Test stand software	$5,264	$0	$5,264	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
3	CompProfF	20%	112 hrs	0 days	9/24/04	1/7/05	$5,264	$5,264	$959	$4,305
21	Klein	20%	408 hrs	0 days	9/24/04	9/29/05	$0	$0	$0	$0

Notes

WBS Description:

Software to test basic functionality of the board. Needs to be ready for the beginning of preproduction testing.

Also, software needed for checkout of production boards.

M&S BOE: N/A

Labor BOE: Rod Klein tasked as the Comp Pro F (20%)
50% time for Jan & Feb 05, 20% time for emaining 7 months.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.2.4.10	Finder Board Preproduction Testing	$47,040	$0	$47,040	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
3	CompProfF	50%	240 hrs	0 days	1/31/05	4/22/05	$11,280	$11,280	$0	$11,280
4	ElecEngF	100%	480 hrs	0 days	1/31/05	4/22/05	$26,400	$26,400	$0	$26,400
5	ElecTechF	50%	240 hrs	0 days	1/31/05	4/22/05	$9,360	$9,360	$0	$9,360
7	PostDocU	50%	240 hrs	0 days	1/31/05	4/22/05	$0	$0	$0	$0
21	Klein	50%	240 hrs	0 days	1/31/05	4/22/05	$0	$0	$0	$0
23	Shaw	50%	240 hrs	0 days	1/31/05	4/22/05	$0	$0	$0	$0
24	Holm	50%	240 hrs	0 days	1/31/05	4/22/05	$0	$0	$0	$0
26	Scott	50%	240 hrs	0 days	1/31/05	4/22/05	$0	$0	$0	$0

Notes

WBS Description:

Finder Board Preproduction Testing: This task involves the testing of the Preproduction module.

M&S BOE: N/A

Labor BOE:

50% FNAL Engineer (T. Shaw)
50% FNAL Engineer (S. Holm)
50% FNAL Sr. Tech (L. Scott)
50% FNAL Programmer (R. Klein)

50% Purdue Postdoc

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.2.4.11	Joint Finder - Transition Board test	$0	$0	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	40%	64 hrs	0 days	2/28/05	3/25/05	$0	$0	$0	$0
8	StudentU	40%	64 hrs	0 days	2/28/05	3/25/05	$0	$0	$0	$0

Notes

WBS Description:

Transition board test.

M&S BOE: N/A

Labor BOE:

Resources: FNAL resources for this test are included in the resources for 1.3.11.2.3.10.
40% Illinois Postdoc (G. Veramendi)
40% Illinois Student

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.2.4.12	Finder Board Preproduction Modification	$4,540	$0	$4,540	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	50%	40 hrs	0 days	4/25/05	5/6/05	$2,200	$2,200	$0	$2,200
5	ElecTechF	75%	60 hrs	0 days	4/25/05	5/6/05	$2,340	$2,340	$0	$2,340
23	Shaw	50%	40 hrs	0 days	4/25/05	5/6/05	$0	$0	$0	$0
25	Wesson	75%	60 hrs	0 days	4/25/05	5/6/05	$0	$0	$0	$0

Notes

WBS Description:

This task involves board schematic and layout modifications.

M&S BOE: N/A

Labor BOE:
75% FNAL Sr. Tech (T. Wesson)
50% FNAL Engineer (T. Shaw)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.2.4.13	Production Readiness Review - Finder Boards	$0	$0	$0	0	0	0

Notes

WBS Description:

Production Readiness Review Finder boards.

M&S BOE: N/A

Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.2.4.14	L3 Preproduction Finder Testing Begins	$0	$0	$0	0	0	3

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
"L3 Preproduction Finder Testing Begins" continued							
1.3.11.2.5	**Production Finder Boards**	**$470,924**	**$440,000**	**$30,924**	**0**	**0**	**0**

Notes

WBS Description:

Production Finder Boards: Fabrication, stuffing and testing of full set of Finder 1/3, Finder 2/4, Finder SL7 boards, including spares.

1.3.11.2.5.1	Begin Production XFT Finder Boards	$0	$0	$0	0	0	2

Notes

WBS Description:

This milestone marks the beginning of production for the Finder SL7 boards after a sucessful production readiness review.

1.3.11.2.5.2	Prepare bid package	$7,520	$0	$7,520	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
4	*ElecEngF*	*25%*	*80 hrs*	*0 days*	*3/29/05*	*5/23/05*	*$4,400*	*$4,400*	*$0*	*$4,400*
5	*ElecTechF*	*25%*	*80 hrs*	*0 days*	*3/29/05*	*5/23/05*	*$3,120*	*$3,120*	*$0*	*$3,120*
23	*Shaw*	*25%*	*80 hrs*	*0 days*	*3/29/05*	*5/23/05*	*$0*	*$0*	*$0*	*$0*
26	*Scott*	*25%*	*80 hrs*	*0 days*	*3/29/05*	*5/23/05*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

Prepare bid package: This tasks refers to work which is done to describe and specify the manufacture of the PCB and the board assembly:

M&S BOE: N/A

Labor BOE:

25% FNAL Engineer (T. Shaw)
25% FNAL Sr. Tech (L. Scott)

1.3.11.2.5.3	Puchase Production Finder Board components	$440,000	$440,000	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*440,000*	*440,000*	*0 days*	*3/15/05*	*6/7/05*	*$440,000*	*$440,000*	*$0*	*$440,000*

Notes

WBS Description:

Purchase Production Finder Board components.

M&S BOE: Total: $440,000 **This translates to $418,410 in FY02 dollars.**

Assume 9 Finders/module ->
SL7: 12 modules
SL5: 12 modules
SL3: 12 modules

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Puchase Production Finder Board components" continued

Notes

36 modules +20% spares = 44 modules @ ~$10K

Labor BOE: N/A

1.3.11.2.5.4	Fabricate Production Finder Board	$0	$0	$0	0.3	0	0

Notes

WBS Description:

Fabricate Production Finder Board components.

M&S BOE: Total: $440,000 **This translates to $418,410 in FY02 dollars.**

Assume 9 Finders/module ->
SL7: 12 modules
SL5: 12 modules
SL3: 12 modules
36 modules +20% spares = 44 modules @ ~$10K

Labor BOE: N/A

1.3.11.2.5.5	Assemble Production Finder Board	$0	$0	$0	0	0	0

Notes

WBS Description:

Assemble Production Finder Board components.

M&S BOE: Total: $440,000 **This translates to $418,410 in FY02 dollars.**

Assume 9 Finders/module ->
SL7: 12 modules
SL5: 12 modules
SL3: 12 modules
36 modules +20% spares = 44 modules @ ~$10K

Labor BOE: N/A

1.3.11.2.5.6	Checkout Production Finder Boards	$21,900	$0	$21,900	0	0.5	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
3	*CompProfF*	*25%*	*100 hrs*	*0 days*	*7/14/05*	*9/22/05*	*$4,700*	*$4,700*	*$0*	*$4,700*
4	*ElecEngF*	*25%*	*100 hrs*	*0 days*	*7/14/05*	*9/22/05*	*$5,500*	*$5,500*	*$0*	*$5,500*
5	*ElecTechF*	*75%*	*300 hrs*	*0 days*	*7/14/05*	*9/22/05*	*$11,700*	*$11,700*	*$0*	*$11,700*
21	*Klein*	*25%*	*100 hrs*	*0 days*	*7/14/05*	*9/22/05*	*$0*	*$0*	*$0*	*$0*
24	*Holm*	*25%*	*100 hrs*	*0 days*	*7/14/05*	*9/22/05*	*$0*	*$0*	*$0*	*$0*
26	*Scott*	*75%*	*300 hrs*	*0 days*	*7/14/05*	*9/22/05*	*$0*	*$0*	*$0*	*$0*

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Checkout Production Finder Boards" continued

Notes

WBS Description:

This task covers the effort required to checkout the Finder modules.

M&S BOE: N/A

Labor BOE:

25% FNAL Engineer (S. Holm)
75% FNAL Sr. Tech (L. Scott)
25% FNAL Programmer (R. Klein)

1.3.11.2.5.7	L3 Finder Board Checkout Complete	$0	$0	$0	0	0	3
1.3.11.2.5.8	L3 Production Finder Checkout Begins	$0	$0	$0	0	0	3
1.3.11.2.5.9	L3 Begin Production XFT Finder Boards	$0	$0	$0	0	0	3
1.3.11.2.5.10	Finder Board Checkout Complete	$0	$0	$0	0	0	2
1.3.11.2.5.11	Final revision of test stand software	$1,504	$0	$1,504	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
3	*CompProfF*	*10%*	*32 hrs*	*0 days*	*4/25/05*	*6/20/05*	*$1,504*	*$1,504*	*$0*	*$1,504*
21	*Klein*	*10%*	*32 hrs*	*0 days*	*4/25/05*	*6/20/05*	*$0*	*$0*	*$0*	*$0*

Notes

Final revison of software used to test Finderboards

Labor BOE: 10% Comp. Prof. FNAL - Rod Klein

1.3.11.3	Test equipment	$23,773	$23,773	$0	0.3	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*23,773*	*23,773*	*0 days*	*1/14/05*	*2/25/05*	*$23,773*	*$23,773*	*$0*	*$23,773*

Notes

WBS Description:

purchase test equipment for production testing of boards

M&S BOE: **This cost is $23,773 in FY02 dollars.**

DVM's , oscilloscope, probes.

Labor BOE:

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Test equipment" continued

Notes

1.3.11.4	**TDC Transition Module**	**$170,000**	**$170,000**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

TDC Transition Module: The design for these boards already exists and is being used in the Run 2A design. Additional boards are required for the Stereo Segment Finding. We need 54 boards + 6 spares.

1.3.11.4.1	TDC Transition Module specification	$0	$0	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
6	*PhysicistU*	*25%*	*100 hrs*	*0 days*	*6/1/04*	*8/10/04*	*$0*	*$0*	*$0*	*$0*
17	*ENG UNIV*	*20%*	*80 hrs*	*0 days*	*6/1/04*	*8/10/04*	*$0*	*$0*	*$0*	*$0*
27	*Kasten*	*20%*	*81.6 hrs*	*0 days*	*6/1/04*	*8/11/04*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

This task involves the full specification of the TDC TM functionality and interfaces.

M&S BOE: N/A

Labor BOE:

25% ILL Physicist (Pitts)
25% ILL Engineer (Kasten)

1.3.11.4.2	TDC Transition Module Firmware development	$0	$0	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
17	*ENG UNIV*	*10%*	*110.4 hrs*	*0 days*	*8/18/04*	*3/9/05*	*$0*	*$0*	*$0*	*$0*
27	*Kasten*	*10%*	*111.2 hrs*	*0 days*	*8/18/04*	*3/10/05*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

TDC Transition Module Firmware development by Illinois personnel.

M&S BOE: N/A

Labor BOE: 15% ILL Engineer (Kasten)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.4.3	**Preproduction TDC Fiber Transition Boards**	**$10,000**	**$10,000**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

Summary task for development of prototype finder boards.

1.3.11.4.3.1 TDC Fiber Transition Board schematic design — $0 | $0 | $0 | 0.5 | 0.5 | 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	*ENG UNIV*	*40%*	*110.4 hrs*	*0 days*	*6/29/04*	*8/17/04*	*$0*	*$0*	*$0*	*$0*
27	*Kasten*	*40%*	*112 hrs*	*0 days*	*6/29/04*	*8/17/04*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

This task will involve the completion of the TDC TM schematic and the design of the board control logic.

M&S BOE: N/A

Labor BOE: 50% ILL Engineer (Kasten)

1.3.11.4.3.2 TDC Fiber Transition Board layout — $0 | $0 | $0 | 0.5 | 0.5 | 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	*ENG UNIV*	*40%*	*96 hrs*	*0 days*	*7/21/04*	*8/31/04*	*$0*	*$0*	*$0*	*$0*
27	*Kasten*	*40%*	*96 hrs*	*0 days*	*7/21/04*	*8/31/04*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

This task will involve the layout implementation of the schematic design.

M&S BOE: N/A

Labor BOE: 50% ILL Engineer (Kasten)

1.3.11.4.3.3 Test Stand Setup (Hardware) — $0 | $0 | $0 | 0.5 | 0.5 | 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
14	*PostDoc*	*10%*	*16 hrs*	*0 days*	*9/1/04*	*9/29/04*	*$0*	*$0*	*$0*	*$0*
17	*ENG UNIV*	*10%*	*16 hrs*	*0 days*	*9/1/04*	*9/29/04*	*$0*	*$0*	*$0*	*$0*
27	*Kasten*	*10%*	*16 hrs*	*0 days*	*9/1/04*	*9/29/04*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

This task will rely heavily upon the TDC Mezzanine card test stand.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Test Stand Setup (Hardware)" continued

Notes

M&S BOE:

Labor BOE:

10% ILL Engineer (Kasten)
10% ILL technician (Sibert)

1.3.11.4.3.4	Purchase Transition Board components	$10,000	$10,000	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
7	*PostDocU*	*10%*	*21.6 hrs*	*0 days*	*8/18/04*	*9/24/04*	*$0*	*$0*	*$0*	*$0*
10	*MANDSPASS*	*10,000*	*10,000*	*0 days*	*8/18/04*	*9/24/04*	*$10,000*	*$10,000*	*$10,000*	*$0*

Notes

WBS Description:

This task will cover the costs of procuring the PCBs and components for ten Preproduction TDC transition modules. The TDC TM will be implemented as a transition module plus a daughter-card. The cost includes both pieces.

M&S BOE: $10,000 (10 preproduction boards @$1,000) **This translates to $9,509 in FY02 dollars.**

Component Cost per module:
PCB @ $250
Formatter FPGA = $100
Connectors: $200
20 Optical transceiver + SERDES @ $120 = $240
Other parts: $200
Board Total = $1000
Assembly: in-house

Labor BOE: 10% ILL Tech (Sibert)

1.3.11.4.3.5	TDC Transition Board fabrication	$0	$0	$0	0.5	0.5	0

Notes

WBS Description:

Period of time for board manufacture

M&S BOE: N/A

Labor BOE: N/A

1.3.11.4.3.6	Assemble Preproduction TDC Transition Board	$0	$0	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
7	*PostDocU*	*50%*	*180 hrs*	*0 days*	*9/27/04*	*11/30/04*	*$0*	*$0*	*$0*	*$0*
8	*StudentU*	*50%*	*180 hrs*	*0 days*	*9/27/04*	*11/30/04*	*$0*	*$0*	*$0*	*$0*

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Assemble Preproduction TDC Transition Board" continued

Notes

WBS Description:

In-house assembly for preproduction.

M&S BOE: N/A

Labor BOE:

50% ILL Tech (Sibert)
50% ILL undergrad tech

1.3.11.4.3.7	TDC Transition Board Testing	$0	$0	$0	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	20%	184 hrs	0 days	9/30/04	3/18/05	$0	$0	$0	$0
8	StudentU	10%	92 hrs	0 days	9/30/04	3/18/05	$0	$0	$0	$0
13	Physicist	60%	552 hrs	0 days	9/30/04	3/18/05	$0	$0	$0	$0
17	ENG UNIV	40%	368 hrs	0 days	9/30/04	3/18/05	$0	$0	$0	$0
27	Kasten	40%	368 hrs	0 days	9/30/04	3/18/05	$0	$0	$0	$0

Notes

WBS Description:

This task involves the testing of the Preproduction module.

M&S BOE: N/A

Labor BOE:

30% ILL Physicist (Pitts)
30% ILL Physicist (Veramendi)
20% ILL Grad Student (Levine)
10% ILL Tech (Sibert)
10% ILL EE (Kasten)

1.3.11.4.3.8	TDC Transition Board B0 Test	$0	$0	$0	0	0	0

Notes

WBS Description:

This task is testing of the transition card in a TDC crate on the detector.

Labor BOE included in WBS 1.3.11.4.3.7

1.3.11.4.3.9	TDC Transition Board Preproduction modification	$0	$0	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
17	ENG UNIV	50%	40 hrs	0 days	3/28/05	4/8/05	$0	$0	$0	$0

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"TDC Transition Board Preproduction modification" continued

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
27	Kasten	50%	40 hrs	0 days	3/28/05	4/8/05	$0	$0	$0	$0

Notes

WBS Description:

This task involves board schematic and layout modifications.

M&S BOE: N/A

Labor BOE: 50% ILL Engineer (Kasten)

1.3.11.4.3.10	Production Readiness Review - TDC Transition Boards	$0	$0	$0	0	0	0
1.3.11.4.3.11	Prepare MOU, SOW, Sole Source to U of I and PO	$0	$0	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	10%	72 hrs	0 days	6/29/04	11/3/04	$0	$0	$0	$0

Notes

WBS Description:

MOU, SOW , Sole Source and PO for U of I to build TDC transition modules, XTC cards and engineering costs for XFT project at Illinois

M&S BOE: N/A

Labor BOE: 10% ILL Physicist (Pitts)

1.3.11.4.3.12	L3 Begin Fiber Transition Board Fabrication	$0	$0	$0	0	0	3
1.3.11.4.3.13	L3 Begin Preproduction FTB Testing	$0	$0	$0	0	0	3
1.3.11.4.3.14	Test Stand Software development	$0	$0	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
8	StudentU	25%	160 hrs	0 days	9/1/04	12/28/04	$0	$0	$0	$0
17	ENG UNIV	25%	270 hrs	0 days	9/1/04	3/18/05	$0	$0	$0	$0
27	Kasten	25%	270 hrs	0 days	9/1/04	3/18/05	$0	$0	$0	$0

Notes

Labor BOE: Mike Kasten Uof I EE

This task includes software to user the pulsar boards to test mezzanine cards and transition cards

1.3.11.4.4	**Production TDC Fiber Transition Boards**	**$160,000**	**$160,000**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

Preproduction Finder Boards: develop a small number (3) preproduction boards to test modifications determined during prototype testing.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.4.4.1	L3 Begin Production TDC Fiber Transition Boards	$0	$0	$0	0	0	3
1.3.11.4.4.2	Purchase TDC Transition Board components	$160,000	$160,000	$0	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	10%	40 hrs	0 days	2/14/05	4/22/05	$0	$0	$0	$0
10	MANDSPASS	160,000	160,000	0 days	2/14/05	4/22/05	$160,000	$160,000	$0	$160,000
17	ENG UNIV	5%	20 hrs	0 days	2/14/05	4/22/05	$0	$0	$0	$0
27	Kasten	5%	20 hrs	0 days	2/14/05	4/22/05	$0	$0	$0	$0

Notes

WBS Description:

Purchase TDC TM components

M&S BOE: 126 modules +25% spares = 160 modules @ $1K for a total of: $160,000. **This translates to $152,150 in FY02 dollars.**

Labor BOE:

5% ILL Engineer (Kasten)

1.3.11.4.4.3	Fabricate TDC Transtion Board	$0	$0	$0	0	0	0

Notes

WBS Description:

Period of time for board manufacture.

M&S BOE: N/A

Labor BOE: N/A

1.3.11.4.4.4	Assemble TDC Transition Board	$0	$0	$0	0.3	0	0

Notes

WBS Description:

Period of time for module assembly.

M&S BOE: N/A

Labor BOE: N/A

1.3.11.4.4.5	Checkout of Production TDC Transition Boards	$0	$0	$0	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	60%	216 hrs	0 days	5/24/05	7/27/05	$0	$0	$0	$0
7	PostDocU	200%	720 hrs	0 days	5/24/05	7/27/05	$0	$0	$0	$0
8	StudentU	20%	72 hrs	0 days	5/24/05	7/27/05	$0	$0	$0	$0

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Checkout of Production TDC Transition Boards" continued

Notes

WBS Description:

Task covers work required to checkout TDC transition modules.

M&S BOE: N/A

Labor BOE:

30% ILL Physicist (Pitts)
30% ILL Physicist (Veramendi)
100% ILL Grad Student (Levine)
100% ILL Grad Student (Chu)
20% ILL Tech (Sibert)

1.3.11.4.4.6	L3 Checkout of TDC Transition Boards Complete	$0	$0	$0	0	0	3
1.3.11.4.4.7	L3 Begin Production TDC Transition Board Checkout	$0	$0	$0	0	0	3
1.3.11.4.4.8	Begin Production TDC Fiber Transition Boards	$0	$0	$0	0	0	2
1.3.11.4.4.9	Checkout of TDC Transition Boards Complete	$0	$0	$0	0	0	2
1.3.11.5	**TDC Mezzanine Card**	**$169,320**	**$169,320**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

TDC Transition Module: The design for these boards already exists and is being used in the Run 2A design. Additional boards are required for the Stereo Segment Finding. We need 54 boards + 6 spares.

1.3.11.5.1	TDC Mezzanine Card firmware development	$61,600	$61,600	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*61,600*	*61,600*	*0 days*	*6/1/04*	*7/12/05*	*$61,600*	*$61,600*	*$31,016*	*$30,584*
17	*ENG UNIV*	*50%*	*536 hrs*	*0 days*	*6/1/04*	*12/8/04*	*$0*	*$0*	*$0*	*$0*
28	*Mokos*	*50%*	*908 hrs*	*53 days*	*8/13/04*	*7/12/05*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

Firmware development

M&S BOE:

0.5*FTE X 40 hrs/wk X $55/hr x 56 wks = $61,600
(note ElecEngF - $55/hr)

Labor BOE: ILL Engineer Mokos (50%) (1120 hrs)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.5.2	**Preproduction TDC Mezzanine Card**	**$22,220**	**$22,220**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

Summary task for development of prototype finder boards.

1.3.11.5.2.1 Test Stand Setup — $4,400 | $4,400 | $0 | 0.5 | 0.5 | 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	*PostDocU*	*5%*	*8 hrs*	*0 days*	*6/1/04*	*6/28/04*	*$0*	*$0*	*$0*	*$0*
12	*MANDSPASSL*	*4,400*	*4,400*	*0 days*	*6/1/04*	*6/28/04*	*$4,400*	*$0*	*$4,400*	*$0*
17	*ENG UNIV*	*60%*	*96 hrs*	*0 days*	*6/1/04*	*6/28/04*	*$0*	*$0*	*$0*	*$0*
27	*Kasten*	*10%*	*16 hrs*	*0 days*	*6/1/04*	*6/28/04*	*$0*	*$0*	*$0*	*$0*
28	*Mokos*	*50%*	*80 hrs*	*0 days*	*6/1/04*	*6/28/04*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

This task involves installation and commissioning of a fully functional CDF VME test stand, including power supply, controller, testclock and TRACER.

M&S BOE: N/A

Labor BOE:

10% ILL engineer (Kasten)
50% ILL engineer (Mokos)
5% ILL technician (Sanders)

0.5 *(FTE) X 4 wks X 40 hrs X 55/hr = $4400
(80 hrs)
(ElecEngF - $55/hr)

1.3.11.5.2.2 TDC Mezzanine Card testing — $13,200 | $13,200 | $0 | 0.5 | 0.5 | 0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	*PostDocU*	*100%*	*760 hrs*	*0 days*	*6/29/04*	*11/10/04*	*$0*	*$0*	*$0*	*$0*
12	*MANDSPASSL*	*13,200*	*13,200*	*0 days*	*6/29/04*	*11/10/04*	*$13,200*	*$13,200*	*$13,200*	*$0*
13	*Physicist*	*25%*	*190 hrs*	*0 days*	*6/29/04*	*11/10/04*	*$0*	*$0*	*$0*	*$0*
17	*ENG UNIV*	*50%*	*380 hrs*	*0 days*	*6/29/04*	*11/10/04*	*$0*	*$0*	*$0*	*$0*
28	*Mokos*	*50%*	*332 hrs*	*12 days*	*7/16/04*	*11/10/04*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

This task will involve full functionality testing of the TMC board in the Illinois test crate, followed by integration tests at both Illinois and Fermilab.

M&S BOE: Mokos' time

0.5 (FTE) X 40 hrs/wk X 12 wks X $55/hr = $13200
(240 hrs)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"TDC Mezzanine Card testing" continued

Notes

(Note ElecEngF - $55/hr)

Labor BOE:

25% ILL Physicist (Junk)
100% ILL Grad Student (Budd)
50% ILL Engineer (Mokos)

1.3.11.5.2.3	TDC Mezzanine Card Preproduction modification	$4,620	$4,620	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*4,620*	*4,620*	*0 days*	*10/21/04*	*11/18/04*	*$4,620*	*$4,620*	*$4,620*	*$0*
17	*ENG UNIV*	*50%*	*84 hrs*	*0 days*	*10/21/04*	*11/18/04*	*$0*	*$0*	*$0*	*$0*
28	*Mokos*	*50%*	*84 hrs*	*0 days*	*10/21/04*	*11/18/04*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

This task will involve layout modifications based upon preproduction test results.

M&S BOE: Mokos' time = $4620
(Note - ElecEngF rate $55/hr)

Labor BOE: 50% ILL Engineer (Mokos)

$55/hr X 84 hrs (=0.5 (FTE) X 4.2 wks X 40hrs/wk) = $4620

1.3.11.5.2.4	Production Readiness Review - TDC Mezzanine Card	$0	$0	$0	0	0	0
1.3.11.5.3	**Production TDC Mezzanine Card**	**$85,500**	**$85,500**	**$0**	**0**	**0**	**0**

Notes

WBS Description:

Preproduction Finder Boards: develop a small number (3) preproduction boards to test modifications determined during prototype testing.

1.3.11.5.3.1	L3 Begin Production TDC Mezzanine Card	$0	$0	$0	0	0	3
1.3.11.5.3.2	Purchase TDC Mezzanine Card components	$80,000	$80,000	$0	0.5	0.5	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
10	*MANDSPASS*	*80,000*	*80,000*	*0 days*	*10/28/04*	*1/19/05*	*$80,000*	*$80,000*	*$66,400*	*$13,600*

Notes

WBS Description:

This task will cover the costs of procuring the PCBs and components for the Production TMC boards.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Purchase TDC Mezzanine Card components" continued

Notes

M&S BOE: 126 boards + 25% spares = 160 boards @ $500 = $80,000. Cost estimate based upon prototype board and includes assembly. **This translates to $76,075 in FY02 dollars.**

Labor BOE: N/A

1.3.11.5.3.3	Fabricate TDC Mezzanine Card	$0	$0	$0	0	0	0

Notes

WBS Description:

Period of time for board manufacture.

1.3.11.5.3.4	Assemble TDC Mezzanine Card	$0	$0	$0	0.3	0	0

Notes

WBS Description:

Period of time for module assembly.

M&S BOE: N/A

Labor BOE: N/A

1.3.11.5.3.5	Checkout of Production TDC Mezzanine Card	$5,500	$5,500	$0	0.5	0.5	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
6	*PhysicistU*	*25%*	*100 hrs*	*0 days*	*2/9/05*	*4/20/05*	*$0*	*$0*	*$0*	*$0*
7	*PostDocU*	*10%*	*40 hrs*	*0 days*	*2/9/05*	*4/20/05*	*$0*	*$0*	*$0*	*$0*
12	*MANDSPASSL*	*5,500*	*5,500*	*0 days*	*2/9/05*	*4/20/05*	*$5,500*	*$5,500*	*$0*	*$5,500*
17	*ENG UNIV*	*25%*	*100 hrs*	*0 days*	*2/9/05*	*4/20/05*	*$0*	*$0*	*$0*	*$0*
28	*Mokos*	*25%*	*100 hrs*	*0 days*	*2/9/05*	*4/20/05*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

This task involves testing of the production boards in the Illinois test stand.

M&S BOE:
UIUC Electrical Engineer (Mokos)

$55/hr X 100 hrs (= 0.25 (FTE) X 10 wks X 40 hrs/wk) = $5500

(Note - ElecEngF rate $55/hr)

Labor BOE:

25% ILL Physicist (Junk)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
"Checkout of Production TDC Mezzanine Card" continued							
Notes							
100% of ILL Grad Student (Budd) 100% of ILL Grad Student (Rogers) 25% ILL Engineer (Mokos) 10% ILL Technician (Sibert)							
1.3.11.5.3.6	L3 Checkout of TDC Mezzanine Cards Complete	$0	$0	$0	0	0	3
1.3.11.5.3.7	L3 Begin Checkout of TDC Mezzanine Card	$0	$0	$0	0	0	3
1.3.11.5.3.8	Begin Production TDC Mezzanine Card	$0	$0	$0	0	0	2
1.3.11.5.3.9	Checkout of TDC Mezzanine Cards Complete	$0	$0	$0	0	0	2
1.3.11.6	**Cables**	**$57,720**	**$51,480**	**$6,240**	**0**	**0**	**0**
Notes							
WBS Description:							
1.3.11.6.1	Finder 3D to L2 Stereo Pulsar	$4,000	$4,000	$0	0.3	0.5	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*4,000*	*4,000*	*0 days*	*1/10/05*	*3/21/05*	*$4,000*	*$4,000*	*$0*	*$4,000*
13	*Physicist*	*10%*	*40 hrs*	*0 days*	*1/10/05*	*3/21/05*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

Finder3D to Stereo Association Module cable fabrication + installation -

M&S BOE:

cost $8000 + contingency Cost of Run 2A Linker to XTRP Cables. Estimated cost of $4,000 for Run IIb Project. **This translates to $3,804 in FY02 dollars.**

Labor BOE:

1.3.11.6.2	Finder to SLAM	$12,480	$12,480	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
9	*MANDS*	*12,480*	*12,480*	*0 days*	*1/10/05*	*3/21/05*	*$12,480*	*$12,480*	*$0*	*$12,480*

Notes

WBS Description:

Stereo finder to SLAM board fiber connections.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Finder to SLAM" continued

Notes

M&S BOE:

Assume 216 fibers + 10% spares = 240 fibers

Newark online catalog price for 3m fiber with LC connectors $52 each

Cost = $12,480

Labor BOE:

1.3.11.6.3	**TDC to Finder**	**$41,240**	**$35,000**	**$6,240**	**0**	**0**	**0**
1.3.11.6.3.1	Specification of TDC to FInder cables	$0	$0	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
7	*PostDocU*	*25%*	*250 hrs*	*0 days*	*7/15/04*	*1/14/05*	*$0*	*$0*	*$0*	*$0*

1.3.11.6.3.2	Order TDC to Finder cables	$35,000	$35,000	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
7	*PostDocU*	*10%*	*40 hrs*	*0 days*	*1/18/05*	*3/28/05*	*$0*	*$0*	*$0*	*$0*
9	*MANDS*	*35,000*	*35,000*	*0 days*	*1/18/05*	*3/28/05*	*$35,000*	*$35,000*	*$0*	*$35,000*

Notes

M&S BOE: Cost includes 325 multi-mode optical fibers with terminations and patch panel. Waiting for additional detaisl from Kevin Pitts.

1.3.11.6.3.3	Install TDC to Finder cables	$6,240	$0	$6,240	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
5	*ElecTechF*	*100%*	*160 hrs*	*0 days*	*3/29/05*	*4/25/05*	*$6,240*	*$6,240*	*$0*	*$6,240*

1.3.11.6.3.4	L3 Receipt of TDC to Finder cables Complete	$0	$0	$0	0	0	3
1.3.11.6.3.5	L3 Specification of TDC to Finder cables Complete	$0	$0	$0	0	0	3
1.3.11.6.3.6	Receipt of TDC to Finder cables Complete	$0	$0	$0	0	0	2
1.3.11.7	**Stereo Linker Association Module (SLAM)**	**$182,020**	**$182,020**	**$0**	**0**	**0**	**0**

Notes

WBS Description:
Linker Output Module II captures the track list from Linker Modules and drives the data to the XTRP and the Stereo Association Module. We need 24 boards + 6 spares

1.3.11.7.1	SLAM Board specification	$0	$0	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
6	*PhysicistU*	*50%*	*240 hrs*	*0 days*	*6/1/04*	*8/24/04*	*$0*	*$0*	*$0*	*$0*

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"SLAM Board specification" continued

Notes

WBS Description:

SLAM Board specification: This task will include design specification and draft report on the SLAM board implementation.

M&S BOE: N/A

Labor BOE:

25% OSU Physicist (Hughes)
25% OSU Physicist (Winer)

1.3.11.7.2	SLAM Board FPGA Firmware development	$0	$0	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	30%	624 hrs	0 days	7/14/04	7/26/05	$0	$0	$0	$0
7	PostDocU	20%	416 hrs	0 days	7/14/04	7/26/05	$0	$0	$0	$0

Notes

WBS Description:

SLAM Board FPGA Firmware development: This work will include development of SLAM chip firmware, VMEbus slave interface and various control algorithms.

M&S BOE: N/A

Labor BOE:

20% OSU Physicist (Lannon)
20% OSU Grad Student (Parks)
10% OSU Physicist (Hughes)

1.3.11.7.3	Linker Board FPGA Firmware modifications	$20,280	$20,280	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	10%	208 hrs	0 days	7/28/04	8/9/05	$0	$0	$0	$0
12	MANDSPASSL	20,280	20,280	0 days	7/28/04	8/9/05	$20,280	$20,280	$8,502	$11,778
31	OSU Tech	25%	520 hrs	0 days	7/28/04	8/9/05	$0	$0	$0	$0

Notes

WBS Description:

Linker Board FPGA Firmware modifications: This work will include modifications of Linker firmware, and Output Formatter firmware.

M&S BOE: $39/hr X 2080 hrs X 25% = $20,280 (Assume FNAL Elec Tech rate of $39/hr)

Labor BOE:

10% OSU Physicist (Winer)
25% OSU Tech (xxxx) (Assume FNAL Elec Tech rate of $39/hr)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.7.4	**Preproduction SLAM Boards**	**$33,940**	**$33,940**	**$0**	**0**	**0**	**0**
1.3.11.7.4.1	SLAM Board schematic design	$0	$0	$0	0.5	0.5	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
6	*PhysicistU*	*25%*	*80 hrs*	*0 days*	*6/29/04*	*8/24/04*	*$0*	*$0*	*$0*	*$0*
17	*ENG UNIV*	*50%*	*160 hrs*	*0 days*	*6/29/04*	*8/24/04*	*$0*	*$0*	*$0*	*$0*
29	*Johnson*	*50%*	*160 hrs*	*0 days*	*6/29/04*	*8/24/04*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

SLAM Board schematic design: This task will involve the completion of the SLAM schematic and the design of the board control logic.

M&S BOE: N/A

Labor BOE:

25% OSU Physicist (Winer)
50% OSU Engineer (Johnson)

1.3.11.7.4.2	SLAM Board Preproduction layout	$4,680	$4,680	$0	0.3	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
12	*MANDSPASSL*	*4,680*	*4,680*	*0 days*	*7/21/04*	*10/27/04*	*$4,680*	*$4,680*	*$4,680*	*$0*
17	*ENG UNIV*	*50%*	*280 hrs*	*0 days*	*7/21/04*	*10/27/04*	*$0*	*$0*	*$0*	*$0*
29	*Johnson*	*50%*	*280 hrs*	*0 days*	*7/21/04*	*10/27/04*	*$0*	*$0*	*$0*	*$0*
31	*OSU Tech*	*50%*	*280 hrs*	*0 days*	*7/21/04*	*10/27/04*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

SLAM Board Preproduction layout: This task will involve the design engineer working closely with a PCB layout professional.

M&S BOE: $39/hr X 240 hrs X 50% = $4,680

Labor BOE:

50% OSU Tech (?) (Assume FNAL Elec Tech rate of $39/hr)
50% OSU Engineer (Johnson)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.7.4.3	Purchase SLAM Board Preproduction components	$17,560	$17,560	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	16,000	16,000	0 days	8/25/04	12/28/04	$16,000	$16,000	$16,000	$0
12	MANDSPASSL	1,560	1,560	0 days	8/25/04	12/28/04	$1,560	$1,560	$1,560	$0
31	OSU Tech	10%	68 hrs	0 days	8/25/04	12/28/04	$0	$0	$0	$0

Notes

WBS Description:

Purchase SLAM Board Preproduction components: This task will cover the costs of procuring the PCBs and components for four Preproduction Finder modules.

M&S BOE: $16,000 (4 prototypes @$4,000) **This translates to $15,215 in FY02 dollars.**

Component Cost per module:
PCB @ $1500
1 SLAM FPGA=$600
1 FPGA VME interface\control = $250
9 Optical transceiver + SERDES @ $120 = $1080
Other parts: $600
Board Total = $4000

Labor BOE: 10% OSU Tech (?) $39/hr X 400 hrs X 10% = $1,560 (Assume FNAL Elec Tech rate of $39/hr)

1.3.11.7.4.4	Fabricate Preproduction SLAM Board	$0	$0	$0	0	0	0

Notes

WBS Definition:

Fabricate Preproduction SLAM Board: Period of time for board manufacture.

M&S BOE: N/A

Labor BOE: N/A

1.3.11.7.4.5	Assemble Preproduction SLAM Board	$0	$0	$0	0.3	0	0

Notes

WBS Description:

Assemble Preproduction SLAM Board: Period of time for module assembly

M&S BOE: N/A

Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.7.4.6	SLAM Board Test Stand setup	$2,340	$2,340	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	2,340	2,340	0 days	10/21/04	1/6/05	$2,340	$2,340	$2,225	$115
13	Physicist	25%	100 hrs	0 days	10/21/04	1/6/05	$0	$0	$0	$0
31	OSU Tech	25%	100 hrs	0 days	10/21/04	1/6/05	$0	$0	$0	$0

Notes

WBS Description:

SLAM Board Test Stand setup: This task involves the physical setup of the test stand.

M&S BOE: $39/hr X 240 hrs X 25% = $2,340 (Assume FNAL Elec Tech rate of $39/hr)

Labor BOE:

25% OSU Physicist (Hughes)
25% OSU Tech (?)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.7.4.7	SLAM Board Preproduction testing	$7,800	$7,800	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	60%	240 hrs	0 days	1/24/05	4/1/05	$0	$0	$0	$0
7	PostDocU	20%	80 hrs	0 days	1/24/05	4/1/05	$0	$0	$0	$0
12	MANDSPASSL	7,800	7,800	0 days	1/24/05	4/1/05	$7,800	$7,800	$0	$7,800
31	OSU Tech	50%	200 hrs	0 days	1/24/05	4/1/05	$0	$0	$0	$0

Notes

WBS Description:

SLAM Board Preproduction testing: This task involves the testing of the Preproduction module.

M&S BOE: $39/hr X 400 hrs X 50% = $7,800 (Assume FNAL Elec Tech rate of $39/hr)

Labor BOE:

30% OSU Physicist (Hughes)
30% OSU Physicist (Winer)
20% OSU Grad Student (Parks)
50% OSU Tech (?)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.7.4.8	Joint SLAM - Finder Test	$0	$0	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	60%	96 hrs	0 days	2/21/05	3/18/05	$0	$0	$0	$0

Notes

WBS Description:

Joint SLAM - Finder Test

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Joint SLAM - Finder Test" continued

Notes

M&S BOE: N/A

Labor BOE:

30% OSU Physicist (Lannon)
30% OSU Physicist (Kilminster)

1.3.11.7.4.9	SLAM Board Preproduction modification	$1,560	$1,560	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	1,560	1,560	0 days	3/21/05	4/1/05	$1,560	$1,560	$0	$1,560
17	ENG UNIV	50%	40 hrs	0 days	3/21/05	4/1/05	$0	$0	$0	$0
29	Johnson	50%	40 hrs	0 days	3/21/05	4/1/05	$0	$0	$0	$0
31	OSU Tech	50%	40 hrs	0 days	3/21/05	4/1/05	$0	$0	$0	$0

Notes

WBS Description:

SLAM Board Preproduction modification: This task involves board schematic and layout modifications.

M&S BOE: $39/hr X 80 hrs X 50% = $1,560 (Assume FNAL Elec Tech rate of $39/hr)

Labor BOE:

50% OSU Tech (?)
50% OSU Engineer (Johnson)

1.3.11.7.4.10	Production Readiness Review - SLAM Board	$0	$0	$0	0	0	0

Notes

WBS Description:

Production readiness Review for SLAM Board

M&S BOE: N/A

Labor BOE: N/A

1.3.11.7.4.11	Prepare MOU, SOW, Sole Source to OSU	$0	$0	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
6	PhysicistU	10%	44 hrs	0 days	8/25/04	11/10/04	$0	$0	$0	$0

Notes

WBS Description:

Prepare MOU, SOW, Sole Source to OSU: This tasks refers to work which is done to describe and specify the manufacture of the PCB and the board assembly.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Prepare MOU, SOW, Sole Source to OSU" continued

Notes

M&S BOE: N/A

Labor BOE:

5% OSU Physicist (Hughes)
5% OSU Physicist (Winer)

1.3.11.7.4.12	L3 Begin Fabrication of Preprod SLAM Board	$0	$0	$0	0	0	3
1.3.11.7.4.13	L3 Begin Preprod SLAM Board Testing	$0	$0	$0	0	0	3
1.3.11.7.5	**Production SLAM Boards**	**$127,800**	**$127,800**	**$0**	**0**	**0**	**0**
1.3.11.7.5.1	L3 Begin Production of SLAM Boards	$0	$0	$0	0	0	3
1.3.11.7.5.2	Purchase SLAM Board components	$121,560	$121,560	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
10	*MANDSPASS*	*120,000*	*120,000*	*0 days*	*3/21/05*	*5/27/05*	*$120,000*	*$120,000*	*$0*	*$120,000*
12	*MANDSPASSL*	*1,560*	*1,560*	*0 days*	*3/21/05*	*5/27/05*	*$1,560*	*$1,560*	*$0*	*$1,560*
31	*OSU Tech*	*10%*	*40 hrs*	*0 days*	*3/21/05*	*5/27/05*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

Purchase SLAM Board components

M&S BOE: $39/hr X 400 hrs X 10% = $1,560 (Assume FNAL Elec Tech rate of $39/hr)

24 modules +20% spares = 30 modules @ ~$4K for a Total of: $120,000. **This translates to $114,112 in FY02 dollars.**

Labor BOE:

10% OSU Tech (?)

1.3.11.7.5.3	Fabricate Production SLAM Board	$0	$0	$0	0	0	0

Notes

WBS Description:

Fabricate Production SLAM Board: Period of time for board manufacture.

M&S BOE: N/A

Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.7.5.4	Assemble Production SLAM Board	$0	$0	$0	0	0	0

Notes

WBS Description:

Assemble Production SLAM Board: Period of time for module assembly.

M&S BOE: N/A

Labor BOE: N/A

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.7.5.5	Checkout Production SLAM Board	$6,240	$6,240	$0	0	0	0

ID	*Resource Name*	*Units*	*Work*	*Delay*	*Start*	*Finish*	*Cost*	*Baseline Cost*	*Act. Cost*	*Rem. Cost*
6	*PhysicistU*	*60%*	*240 hrs*	*0 days*	*6/21/05*	*8/30/05*	*$0*	*$0*	*$0*	*$0*
7	*PostDocU*	*20%*	*80 hrs*	*0 days*	*6/21/05*	*8/30/05*	*$0*	*$0*	*$0*	*$0*
12	*MANDSPASSL*	*6,240*	*6,240*	*0 days*	*6/21/05*	*8/30/05*	*$6,240*	*$6,240*	*$0*	*$6,240*
31	*OSU Tech*	*50%*	*200 hrs*	*0 days*	*6/21/05*	*8/30/05*	*$0*	*$0*	*$0*	*$0*

Notes

WBS Description:

Checkout Production SLAM Board: Task covers work required to checkout Finder modules.

M&S BOE: $39/hr X 320 hrs X 50% = $6,240 (Assume FNAL Elec Tech rate of $39/hr)

Labor BOE:

30% OSU Physicist (Hughes)
30% OSU Physicist (Winer)
20% OSU Grad Student (Parks)
50% OSU Tech (?)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.7.5.6	L3 Checkout of SLAM Boards Complete	$0	$0	$0	0	0	3
1.3.11.7.5.7	L3 Begin Production SLAM Board Checkout	$0	$0	$0	0	0	3
1.3.11.7.5.8	Begin Production of SLAM Boards	$0	$0	$0	0	0	2
1.3.11.7.5.9	Checkout of SLAM Boards Complete	$0	$0	$0	0	0	2
1.3.11.8	**Level 2 Stereo Interface**	**$77,738**	**$65,200**	**$12,538**	**0**	**0**	**0**

Notes

WBS Description:

Summary task for XFT-> Level 2 interface board.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.8.1	Specify Pulsar Board for L2 stereo	$0	$0	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	10%	104 hrs	0 days	6/1/04	12/3/04	$0	$0	$0	$0

Notes

Labor BOE: Greg Veramendi

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.8.2	Level 2 Interface Board Firmware (ILL)	$17,600	$17,600	$0	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
12	MANDSPASSL	17,600	17,600	0 days	1/7/05	9/21/05	$17,600	$17,600	$0	$17,600
28	Mokos	20%	288 hrs	0 days	1/7/05	9/21/05	$0	$0	$0	$0

Notes

WBS Description:

Exact design will await specifications of the Run 2b Level 2 trigger system. Format will be quite similar to the Run 2a Level 2 interface, but exact digital links are yet to be specified. The In-Kind resources (money and /or labor) provided by UIUC are listed in this task. The resources provided by FNAL are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Time estimate based upon Run 2a XTRP/L2 interface.

20% UIUC Electrical Eng (Mokos) - 40w (320h)@$55/hr = $17,600
(Note ElecEngF - $55/hr)

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.8.3	Level 2 Interface Board Firmware (FNAL)	$7,920	$0	$7,920	0.5	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
4	ElecEngF	10%	144 hrs	0 days	1/7/05	9/21/05	$7,920	$8,800	$0	$7,920
24	Holm	10%	144 hrs	0 days	1/7/05	9/21/05	$0	$0	$0	$0

Notes

WBS Description:

Exact design will await specifications of the Run 2b Level 2 trigger system. Format will be quite similar to the Run 2a Level 2 interface, but exact digital links are yet to be specified. The resources (money and /or labor) provided by FNAL are listed in this task. INKIND resources provided by other sources are listed in the other identical tasks.

M&S BOE: N/A

Labor BOE:
Time estimate based upon Run 2a XTRP/L2 interface.

100% UIUC Electrical Eng - 8w (320h)@$62/hr * 0.25 (Eng. Labor reimbursement rate) = $4960

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.8.4	Level 2 Interface Board Testing	$0	$0	$0	0	0.5	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
13	Physicist	100%	320 hrs	0 days	4/11/05	6/6/05	$0	$0	$0	$0

Notes

WBS Description:

Time to install and check out Level 2 interface board. Will be performed in conjunction with Level 2 system testing.

M&S BOE: N/A

Labor BOE:
Physicist's estimate.

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level
1.3.11.8.5	**Pulsar & Mezzanine boards**	**$52,218**	**$47,600**	**$4,618**	**0**	**0**	**0**
1.3.11.8.5.1	Purchase Pulsar Board components	$47,600	$47,600	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
10	MANDSPASS	47,600	47,600	0 days	11/4/04	2/11/05	$47,600	$47,600	$28,214	$19,386

Notes

M&S BOE: Six pulsar boards at $4,100 each = $24,600 in FY04 dollars

Hot link receiver mezzanine cards: 20 at $300 each = $6,000 in FY04 dollars

Hot link transmitter mezzanine cards (partially populated): 40 at $200 each = $8,000 in FY04 dollars

S-Link mezzanine cards: 6 pairs at $1,500 per pair = $9,000 in FY04 dollars

Total = $47,600 in FY04 dollars **$45,265 in FY02 dollars**

1.3.11.8.5.2	Fabrication of Pulsar & Mezzanine Boards for L2 stereo	$0	$0	$0	0	0	0
1.3.11.8.5.3	Assembly of Pulsar & Mezzanine Boards for L2 stereo	$0	$0	$0	0	0	0
1.3.11.8.5.4	L3 Begin Purchase of Pulsar Board components	$0	$0	$0	0	0	3
1.3.11.8.5.5	Begin Purchase of Pulsar Board components	$0	$0	$0	0	0	2
1.3.11.8.5.6	Modify Univ of Chicago SOW and MOU for Pulsar Purchases	$0	$0	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
1	PhysicistF	10%	24 hrs	0 days	8/9/04	9/20/04	$0	$0	$0	$0
6	PhysicistU	10%	24 hrs	0 days	8/9/04	9/20/04	$0	$0	$0	$0

1.3.11.8.5.7	Checkout of Pulsar boards for Level 2 stereo and SVT	$4,618	$0	$4,618	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
5	ElecTechF	37%	118.4 hrs	0 days	3/14/05	5/6/05	$4,618	$4,680	$0	$4,618

WBS	Name	Cost	M&S	FNAL Labor	M&S Cont.	Labor	Level

"Checkout of Pulsar boards for Level 2 stereo and SVT" continued

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
30	Prep Tech	50%	160 hrs	0 days	3/14/05	5/6/05	$0	$0	$0	$0

Notes

Labor BOE

6wks - 50% of FNAL Prep Tech for check out of Pulsar boards
Note this includes testing of the boards for SVT

1.3.11.8.6 Joint testing with Finder board	$0	$0	$0	0	0	0

ID	Resource Name	Units	Work	Delay	Start	Finish	Cost	Baseline Cost	Act. Cost	Rem. Cost
7	PostDocU	50%	80 hrs	0 days	5/2/05	5/27/05	$0	$0	$0	$0

Notes

Labor BOE: Greg Veramendi

1.3.11.8.7 L3 Begin Joint Testing with Finder Board	$0	$0	$0	0	0	3
1.3.11.8.8 Begin Joint Testing with Finder Board	$0	$0	$0	0	0	2
1.3.11.9 L3 XFT Ready for Installation at CDF	$0	$0	$0	0	0	3

Notes

Level 3 milestone

1.3.11.10 XFT Ready for Installation at CDF	$0	$0	$0	0	0	2

Notes

WBS Description:
Milestone indicating XFT project complete.

1.31 L3 Start of Run 2b DAQ and Trigger Project	$0	$0	$0	0	0	3

Notes

WBS Description:
Milestone - marking the beginning of the Run 2b DAQ and Trigger upgrade project